
A SYSTEMATIC REVISION OF *GAERTNERA* (RUBIACEAE, *GAERTNEREAE*)¹

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ABSTRACT

The Paleotropical genus *Gaertnera* Lam. (nom. cons.) comprises 69 species, plus one presumed natural hybrid, of shrubs and small trees found from West Africa to Sulawesi in southeastern Asia, with 13 of them newly described here. *Gaertnera* is characterized in the Rubiaceae by its tubular stipules of various forms, secondarily superior ovaries, and drupaceous fruits. Molecular phylogenetic analyses support *Gaertnera* as monophyletic and sister to the Neotropical genus *Pagamea* Aubl., but do not support infrageneric classification of *Gaertnera*. The morphology of *Gaertnera* is notably variable; molecular analyses indicate that most diversification is within regions, and that much of it is autapomorphic or homoplasious. *Gaertnera* species of Africa, Madagascar, the Mascarene Islands, and Sri Lanka are hermaphroditic and usually demonstrably distylous, while those of Southeast Asia for which information is available are dioecious, sometimes cryptically so, and apparently derived within the genus. All species recognized here are regional endemics, and accordingly regional keys are included here. In Africa, 12 species and two subspecies are recognized in this present work; *G. paniculata* Benth. is the most widespread of these; *G. aurea* Malcomber, *G. gabonensis* Malcomber, and *G. letouzeyi* Malcomber are newly described here; and the new combination *G. longivaginalis* (Schweinf. ex Hiern) E. M. A. Petit var. *bracteata* (E. M. A. Petit) Malcomber is made based on *G. bracteata* E. M. A. Petit. In Sri Lanka, six species plus the presumed natural hybrid *G. ×gardneri* Thwaites are recognized; all of these have been previously described; *G. vaginans* (DC.) Merr. is the most commonly collected. In Southeast Asia, 14 species are recognized here; *G. junghuhniana* Miq. is the most commonly collected and widespread; *G. alstonii* Malcomber, *G. aphanodioica* Malcomber, *G. belumutensis* Malcomber, *G. capitulata* Malcomber, and *G. kochummenii* Malcomber are newly described here. *Gaertnera* has its center of diversity in Madagascar and the Mascarene Islands, with 36 species and two subspecies recognized in this present work; *G. obovata* Baker of Madagascar is the most widespread and common; *G. ianthina* Malcomber, *G. lowryi* Malcomber, *G. monstrosa* Malcomber, *G. raphaelii* Malcomber, and *G. schatzii* Malcomber are newly described here; and the new combination *G. obovata* var. *sphaerocarpa* (Baker) Malcomber is made based on *G. sphaerocarpa* Baker. Here, *G. vaginans* is treated as a morphologically well-defined species of Sri Lanka, and the remaining plants included in this species by some previous authors are treated here in 10 additional species, four of them newly described. The following names are newly lectotypified: *G. crinita* Drake, *G. dinklagei* K. Schum., *G. fissistipula* (K. Schum. & K. Krause) E. M. A. Petit, *G. hispida* Aug. DC., *G. inflexa* Baill., *G. macrostipula* Baker, *G. oblanceolata* King & Gamble, *G. paniculata*, *G. phanerophlebia* Baker, *G. phyllostachya* Baker, *G. plagiocalyx* K. Schum., *G. sphaerocarpa* Baker, and *G. spicata* K. Schum. Original figures illustrate 24 species here, and an Index to Numbered Collections compiles the identifications of most of the ca. 3500 specimens studied.

Key words: *Aetheonoma*, Africa, Angola, Benin, Borneo, Brunei, Burkina Faso, Cambodia, Cameroon, Central African Republic, Côte d'Ivoire, Democratic Republic of the Congo, dioecy, floristics, *Fructesca*, Gabon, *Gaertnera*, *Gaertnerae*, Ghana, Guinea, heterodistyly, *Hymenocnemis*, Indonesia, IUCN Red List, Liberia, Madagascar, Mali, Mascarene Islands, Mauritius, Nigeria, *Pagamea*, phylogenetic analysis, *Pristidia*, Republic of the Congo, Réunion, Rubiaceae, Senegal, Sierra Leone, Southeast Asia, Sri Lanka, Sulawesi, Sumatra, *Sykesia*, taxonomy, Thailand, Togo, Vietnam, Zambia.

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Gaertnera Lam. (Rubiaceae) is a widespread and morphologically variable genus of small trees and shrubs found throughout the moist tropics of Africa, Madagascar, the Mascarene islands of Réunion and Mauritius, Sri Lanka, continental Southeast Asia, Borneo, and Sulawesi (Fig. 1). The genus is found from sea level to over 2000 m in evergreen forests, and grows in a variety of habitats from upland vegetation on clay and loam soils, to low-altitude swamps and littoral forests on laterite, white sand, or other substrates, to high-altitude moss forests in Sri Lanka. This is one of two genera of the tribe Gaertnereae, of the subfamily Rubioideae (Bremer & Manen, 2000; Robbrecht & Manen, 2006); the other is *Pagamea* Aubl. of South America. *Gaertnera* can be recognized by its woody habit; opposite or rarely ternate leaves; generally well-developed tubular stipules; distinctive ridges or wings that encircle the sides and bottom of the petiole and often extend upward onto the stipule sheath; cymose, few- to many-flowered, bracteate inflorescences borne in a terminal, pseudoaxillary, axillary, and/or supra-axillary position; calyx limb with a well-developed tube; salverform to funnelform, usually white to pink corollas with four or five valvate lobes; the ovary superior in flower; and also in the fleshy, purple-black drupaceous fruit (Fig. 2). The superior position of the ovary is unusual in the Rubiaceae and apparently secondarily derived (Igersheim et al., 1994). A few other Rubiaceae genera, mostly Neotropical, also have ovaries that are partially to fully superior at least in fruit (Robbrecht, 1988). *Gaertnera* is very similar to *Pagamea*, and these appear to be allopatric sister genera as discussed further below. *Gaertnera* is also similar in general aspect to species of *Chassalia* Comm. ex Poir. in some regions; however, *Chassalia* has smooth stipules and petiole bases and a fully inferior ovary in flower and fruit. *Gaertnera* is also notable for the variation in its breeding biology, with the species of Africa, Madagascar, the Mascarene Islands, and Sri Lanka for which the biology is known all distylous but the species of southeastern Asia apparently all dioecious, with this latter condition apparently derived (Malcomber, 2002). *Gaertnera* is additionally notable for its wide variation in morphological features but limited variation in the nucleotide sequences that are phylogenetically informative in many other plants (Malcomber, 2002), with similar characters evolved in parallel in geographically local radiations.

Gaertnera has not been monographed comprehensively since A. P. de Candolle's work (1845), but several regional treatments have been published. Baker (1877), Drake (1899), and Verdcourt (1983, 1989) treated the Mascarene species, which are by far

the most intensively studied. Drake (1899) also treated the Madagascar species. Petit (1959a, b, 1962) studied the African species, with a focus on those of the Congo region. Van Beusekom (1967) revised the Sri Lankan and Southeast Asian species, along with some taxa from Africa, Madagascar, and the Mascarene Islands that he considered related. Malcomber and Davis (2005) recently described several new species from Madagascar in a review of the *Gaertnera* species with 1- to few-flowered inflorescences found in that region.

We present a comprehensive revision of the species of *Gaertnera* here, based primarily on study of herbarium specimens, molecular analyses, and fieldwork by S.T.M. The species circumscriptions are based on Malcomber (2000) and should be credited solely to S.T.M. This present work will be supplemented by some additional materials presented online (<<http://www.tropicos.org/Project/Rubiaceae>>).

As with other tropical Rubiaceae, many species of *Gaertnera* are geographically restricted and/or poorly known. In fact, the Mascarene species *G. calycina* Bojer and *G. crassiflora* Bojer are considered extinct, and other *Gaertnera* species must be considered on the verge of extinction given the current knowledge of their geographic range. However, the Mascarene species *G. longifolia* Bojer was also considered extinct at one time (Walter & Gillett, 1998) but has been rediscovered in an area dominated by introduced species (Anonymous, 1997). Similarly, before this present study, *G. fractiflexa* Beusekom, *G. globigera* Beusekom, and *G. schizocalyx* Bremek., all from Malaysia, as well as *G. microphylla* Capuron ex Malcomber & A. P. Davis from Madagascar had not been collected for 35 to 100 years, but all were located again by S.T.M. in 1997–1998. With the current rate of deforestation in the tropics, additional research on the population size and ecological requirements of many species are desperately required if there is to be any long-term conservation of many of these species.

METHODS

DESCRIPTIVE DATA

This revision of *Gaertnera* is based on the study of more than 3500 herbarium specimens from throughout its range, and on field studies conducted by S.T.M. over 12 months in Brunei, Madagascar, Malaysia, Mauritius, Singapore, and Sri Lanka, during which 230 collections were made. Specimens were studied from the collections cited in the acknowledgments. Flower and fruit measurements are based on collections preserved in alcohol or rehydrated herbarium

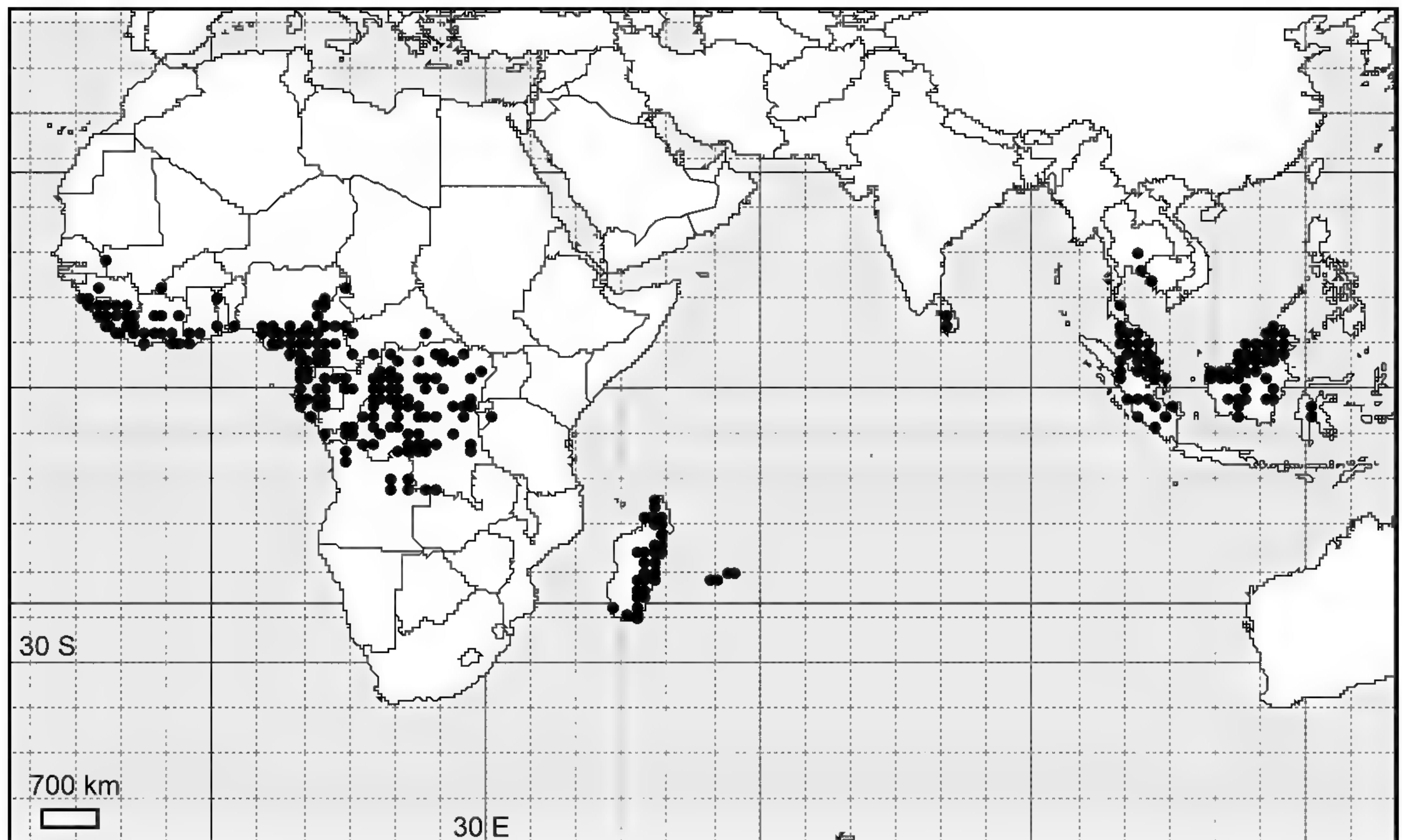


Figure 1. Geographic range of *Gaertnera*. Points represent individual herbarium specimens.

specimens. All other measurements (e.g., leaf length, leaf width, stipule length, cyme length and width) were taken from dried specimens. The species descriptions were initially generated using DELTA software (Dallwitz et al., 1999) and then edited.

In the treatment below, the morphological characters of the genus are summarized in the genus description. In the individual species descriptions for several characters, only the uncommon conditions are described, e.g., the fenestrate corolla of one species and the pendulous inflorescences of a few species. Only selected specimens are provided as broad geographic vouchers except in a few cases in which the species are poorly known or newly described here; a complete list of the numbered collections and their identifications is included as Appendix 1. All collectors are identified there by initials of first names where possible; only collectors of unnumbered specimens are thus identified in the specimens cited in the text. However, some collectors only use one name (e.g., Dorr, 1997), while a few first names have not been traced. For some relatively small areas (e.g., Réunion, Mauritius), internal political units are not separated.

An index of all taxa treated in the current revision is provided in Appendix 2, with accepted names in *Gaertnera* presented in boldface.

In a few cases, holotype specimens deposited at P were not located. The searching done for these specimens at that institution was extensive but not

exhaustive, and did locate some materials. Thus, we are reluctant to conclude that the remaining missing specimens are lost and therefore have not yet lectotypified several names pending further searching, although lectotypification may ultimately be necessary.

SPECIES CIRCUMSCRIPTION

What constitutes a species is controversial, and at least 22 different species concepts have now been published (Mishler, 1999). However, most concepts equate species with population lineages and only differ in the phenomena emphasized to diagnose inclusion within the category (De Queiroz, 1998). The diagnosable morphological units classified here as species are hypotheses recognized by non-overlapping character distributions. Units that are diagnosable at the limits of their morphological range but not diagnosable otherwise and overlapping geographically are classified here as varieties. The units recognized in this revision satisfy the criteria imposed by the general lineage concept of species, and therefore represent segments of population-level evolutionary lineages (De Queiroz, 1998, 1999). Preliminary phylogenetic analyses of separate and combined nuclear DNA (nDNA) data sets for *Gaertnera* species using the nDNA markers ITS, *PepC*-Large (*PepC*-L), *PepC*-Small (*PepC*-S), and *Tpi* found that multiple accessions of the same species all formed a single

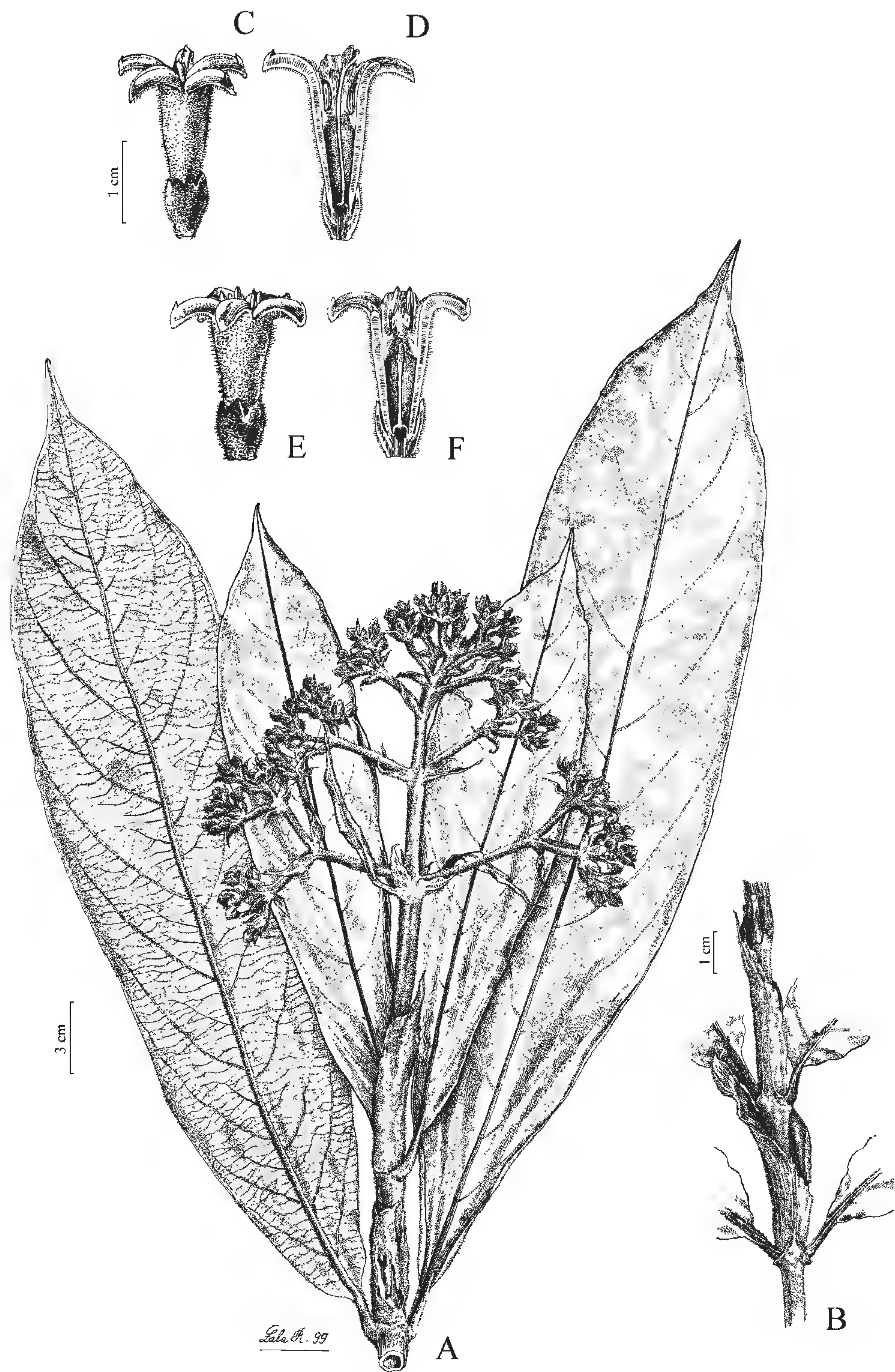


Figure 2. *Gaertnera schatzii* Malcomber. —A. Flowering branch. —B. Portion of stem with leaf bases and stipules. —C. Long-styled flower. —D. Long-styled flower in cross section. —E. Short-styled flower. —F. Short-styled flower in cross section. C–F to same 1-cm scale. A, B based on *Malcomber 2829*; C–F based on *Moise 9*.

Table 1. List of sequences included in the molecular analyses. Herbarium voucher information is included within the GenBank accession number.

Taxon	ITS	<i>PepC</i> -Large	<i>PepC</i> -Small
<i>Gaertnera aphanodioica</i> Malcomber	AF333817	AY046371	AF333876
<i>G. arenaria</i> Baker	AY185543	AY185544	AY185545
<i>G. belumutensis</i> Malcomber	AF333818	AF333849	AF333877
<i>G. brevipedicellata</i> Malcomber & A. P. Davis	AF333819	AY046374	AY046344
<i>G. capitulata</i> Malcomber	AY185546	AY185547	AY185548
<i>G. cooperi</i> Hutch. & M. B. Moss	AF333820	AF333851	AF333879
<i>G. cuneifolia</i> Bojer	AF333821	AY046376	AY046346
<i>G. drakeana</i> Aug. DC.	AF333822	AF333853	AY046348
<i>G. edentata</i> Bojer	AF333823	AF333854	AF333882
<i>G. fractiflexa</i> Beusekom	AF333824	AF333855	AY046357
<i>G. globigera</i> Beusekom	AF333825	AF333856	AY046333
<i>G. hispida</i> Aug. DC.	AF333826	AF333857	AF333885
<i>G. inflexa</i> Baill.	AF333827	AF333858	AY046335
<i>G. junghuhniana</i> Miq.	AY046326	AY046377	AY046365
<i>G. longivaginalis</i> (Schweinf. ex Hiern) E. M. A. Petit	AY185549	AY185550	AY185551
<i>G. longifolia</i> Bojer	AF333829	AF333860	AY046337
<i>G. lowryi</i> Malcomber	AF333830	AY046379	AY046341
<i>G. macrostipula</i> Baker	AF333831	AF333862	AY046343
<i>G. madagascariensis</i> (Hook. f.) Malcomber & A. P. Davis	AF333832	AF333863	AF333891
<i>G. oblanceolata</i> King & Gamble	AF333833	AF333864	AF333892
<i>G. paniculata</i> Benth.	AY046329	AF333865	AF333893
<i>G. pauciflora</i> Malcomber & A. P. Davis	AF333835	AF333866	AF333894
<i>G. psychotrioides</i> (DC.) Baker	AF333835	AF333867	AY046362
<i>G. ramosa</i> Ridl.	AF333816	AF33384	AY046338
<i>G. rosea</i> Thwaites ex Benth.	AF333837	—	AF333896
<i>G. schatzii</i> Malcomber	AF333838	AF333868	AF333897
<i>G. schizocalyx</i> Bremek.	AF333839	AF333869	AY046355
<i>G. ternifolia</i> Thwaites	AY046331	AF333870	AY046361
<i>G. vaginans</i> (DC.) Merr.	AF333841	—	AY046350
<i>G. viminea</i> Hook. f. ex C. B. Clarke	AF333842	AF333871	AY046354
<i>G. walkeri</i> (Arn.) Blume	AF333843	AF333872	AY046356
<i>Morinda citrifolia</i> L.	AF333844	AF333873	AF333903
<i>M. royoc</i> L.	AF333845	AF333874	AY046370
<i>Pagamea guianensis</i> Aubl.	AF333846	—	AF333905

cluster, and thus represent phylogenetic species (Malcomber, 2002, unpublished data).

MOLECULAR PHYLOGENETICS

ITS, *PepC*-L, and *PepC*-S sequences for 29 *Gaertnera* species, *Pagamea guianensis* Aubl. as a representative of the sister genus, and the outgroups *Morinda citrifolia* L. and *M. royoc* L. (i.e., the sequences previously analyzed by Malcomber & Davis, 2005) were supplemented with ITS, *PepC*-L, and *PepC*-S sequences for *G. arenaria* Baker and *G. capitulata* Malcomber (Table 1). The 31 *Gaertnera* species included in this analysis sample the entire geographic range of the genus (Gabon, Democratic Republic of the Congo, Madagascar, Mauritius, Sri Lanka, Malaysia, and Brunei) and include nine of the 12 species recognized here within the *G. vaginans* complex (discussed below).

Total genomic DNA was extracted from silica-dried leaves using the CTAB miniprep protocol of Doyle and Doyle (1987). Double-stranded polymerase chain reaction (PCR) products of the ITS region were amplified using the primers ITSLEU1 and ITS4, and the two copies of the fourth intron of *PepC* were amplified using the primers PEPCX4F and PEPCX5R in 50 µl PCR reactions as described in Malcomber (2002). The ITS PCR reactions produced a single product of approximately 650 bp, whereas the *PepC* PCR reactions amplified two distinct products of approximately 450 bp and 900 bp. PCR products were gel purified using Qiaquick columns (Qiagen Inc., Valencia, California, U.S.A.) and sub-cloned using pGEM-T easy vector systems (Promega Corp., Madison, Wisconsin, U.S.A.). Plasmid DNA was cleaned using an alkaline lysis/PEG precipitation protocol (Sambrook et al., 1989) prior to sequencing. ITS clones were sequenced using plasmid primers T7

and SP6 and internal primers ITS2 (White et al., 1990) and ITS3B (Baum et al., 1994). To check for intra-individual variation among ITS paralogs, two to four clones were sequenced and dimethyl sulfoxide was used in both the PCR and sequencing reactions, following the recommendations of Buckler et al. (1997). *PepC* clones were sequenced in both directions using plasmid primers T7 and SP6 for the 450 bp (*PepC*-S) product and primers T7, PEPCINTF, PEPCINTR, and SP6 for the 900 bp (*PepC*-L) product as described in Malcomber (2002). Dideoxy sequencing was conducted using the BigDye dye terminator cycle sequencing protocol (from Applied Biosystems, Foster City, California, U.S.A.), and sequencing reactions were analyzed on an ABI3100 (Applied Biosystems) automated DNA sequencer.

Preliminary alignment of the ITS, *PepC*-L, and *PepC*-S sequences was performed using Clustal W (Thompson et al., 1994), before being manually edited using MacClade 4.0 (Maddison & Maddison, 2003). Sequences were analyzed using Bayesian phylogenetic methods as implemented in MrBayes 3.2 (Huelsenbeck & Ronquist, 2001) using the general time reversible (GTR) model of evolution and Gamma distributed rates (GTR + G), as estimated by Modeltest 3.06 (Posada & Crandall, 1998). Each Markov chain was started from a random tree and run twice for 5,000,000 cycles each, sampling every 100th cycle from the chain. Four chains were run simultaneously with the initial 2000 cycles discarded as burn-in. To verify that stationarity had been reached, the fluctuating value of the likelihood was monitored graphically. Default settings for the priors were used on the rate matrix, branch lengths, gamma shape parameter, and proportion of invariable sites. Posterior probabilities were used to evaluate the support of specific nodes.

TAXONOMIC HISTORY AND GENERIC RELATIONSHIPS

Gaertnera was described by Lamarck (1792) as a genus of Rubiaceae based on a Commerson collection labeled as coming from Île de France, today called Mauritius. Verdcourt (1989) noted that the Commerson collection was undoubtedly made on Réunion (then called Bourbon) instead. *Gaertnera* was named in honor of German botanist Joseph Gaertner (1732–1791), who researched the seed and fruit structures of angiosperms. Lamarck subsequently described one species, *G. vaginata* Lam. The places of publication, dates, and authorship of these names have been widely (and variously) cited incorrectly. Several of Lamarck's contemporary authors also described genera named for Gaertner, thus complicating the

nomenclature of this genus. The name *Gaertnera* is formally conserved in the usage detailed here; the list of excluded names is relatively long here because several of these *Gaertnera* species were described in other, homonymic genera. As an earlier solution to the problem of the duplicated genus names, Kuntze (1891) replaced *Gaertnera* as the name used for the plants treated here with the name *Sykesia* Arn., as discussed below. Petit (1959a) has summarized much of the nomenclatural history of *Gaertnera*.

Although Gaertner (1806) remarked that this genus clearly belonged in the Rubiaceae despite its superior ovary, Jussieu (1807) contemporaneously first concluded that *Gaertnera* did not belong in the Rubiaceae. He noted that although the opposite leaves, fused stipules, flowers arranged in a corymb, and opposite branching pattern all suggested affinities between *Gaertnera* and members of the Rubiaceae, the superior ovary of the fruit instead suggested affinities with the Apocynaceae. He concluded that *Gaertnera* was better included in a new family transitional between the Apocynaceae and Rubiaceae. Brown (1814) implemented this, describing the family "Loganeae" (i.e., Loganiaceae) to include *Logania* R. Br., *Geniostoma* J. R. Forst. & G. Forst., *Usteria* Willd., *Gaertnera*, *Pagamea*, and provisionally *Fagraea* Thunb., although he later (1818) regarded this family as not completely natural. *Gaertnera* was retained in the Loganiaceae by de Candolle (1845) and Bentham and Hooker (1876). Baillon (1879) then returned *Gaertnera* to the Rubiaceae, noting that *Pagamea* and *Gaertnera* did not differ significantly from *Psychotria* L. and *Chassalia* because *Gaertnera*'s ovary was not completely free, as in other Loganiaceae, but fused to the calyx at the base. Solereder (1890) agreed that *Gaertnera* belonged in the Rubiaceae based on the presence of raphides and the absence of intraxylary phloem, and concluded that it was related to *Psychotria* and *Chassalia*. *Gaertnera* was subsequently usually included within the Rubiaceae (Schumann, 1891; Klett, 1924; Bremekamp, 1954, 1966; Verdcourt, 1958; Robbrecht, 1988) but was still sometimes included in Loganiaceae (De Cordonoy, 1893; Ridley, 1908, 1915, 1934; Fischer, 1927, 1928; Hutchinson & Dalziel, 1931). Recent molecular analyses have all confirmed the placement of *Gaertnera* and *Pagamea* in the Rubiaceae and agreed on a close relationship between these two genera, *Psychotria*, and *Morinda* L. (Bremer, 1996; Andersson & Rova, 1999; Nepokroeff et al., 1999).

A close relationship between *Gaertnera* and the South American genus *Pagamea* has been hypothesized since the early 19th century, based on their shared sheathing stipules and secondarily derived superior ovaries, and more recently based also on

their xylem with parenchyma bands and compound pollen apertures with crescent-shaped “costae” (Igershiem et al., 1994; Jansen et al., 1996a, b, 1997). Molecular phylogenetic analyses of chloroplast DNA (cpDNA) (Andersson & Rova, 1999) found *Gaertnera* and *Pagamea* to form a well-supported clade related to the Morindeae and Psychotrieae, and subsequent authors have treated this clade as a tribe (Bremer & Manen, 2000; Robbrecht & Manen, 2006).

Although molecular phylogenetic analyses of multiple nDNA (Malcomber, 2002) and cpDNA (Vicentini, 2007) regions suggest that *Gaertnera* and *Pagamea* are both monophyletic, few morphological synapomorphies distinguish the genera. The only consistent one is the presence of indumentum on the inside (i.e., adaxial face) of the corolla lobes in *Pagamea* (Taylor et al., 2004) versus glabrous in *Gaertnera*. Another morphological difference may be the development of the distinctive ridge or wing surrounding the base of the petiole in *Gaertnera*, which is apparently absent in *Pagamea*; however, this structure is reduced and difficult to detect in some species of *Gaertnera*. Some characters that have been used to separate the two genera cannot be interpreted as synapomorphies. *Gaertnera* cannot be differentiated from *Pagamea* based on the position of the inflorescence: in *Pagamea* the inflorescence is axillary, while in *Gaertnera* it is usually terminal but may be supra-axillary (e.g., *G. diversifolia* Ridl.) or axillary (e.g., *G. oblongeolata* King & Gamble). Schumann (1891) reported that these genera also differ in the ruminant endosperm of *Pagamea* (Piesschaert, 2001) versus entire in *Gaertnera*, but a few species of *Gaertnera* (e.g., *G. cooperi* Hutch. & M. B. Moss, *G. aurea* Malcomber) also have ruminant endosperm. Wood anatomy and pollen morphology may provide additional synapomorphies to support the monophyly of the two genera: Jansen et al. (1996b) demonstrated that eight *Gaertnera* species from Africa and the Mascarene Islands differ from four *Pagamea* species in wood anatomy and in pollen morphology. In particular, they documented wood differences in vessel outline, diameter, and density, and number of cells in the parenchyma bands and the distance between the bands, and that *Pagamea* pollen is smaller than *Gaertnera* pollen, has a more rounded outline in polar view, and has a less-developed margo. However, these conclusions are based on a partial sampling of both genera and remain to be confirmed globally.

GENERIC CIRCUMSCRIPTION AND INFRAGENERIC CLASSIFICATION

Arnott (1836) accepted the placement of *Gaertnera* in the Loganiaceae and established the tribe Gaert-

nereae for this and *Sykesia*, which was separated from *Gaertnera* based on the presence of hairs in the corolla throat and comprised three species from Sri Lanka. Endlicher (1838) subsequently included *Sykesia* in *Gaertnera* but did not publish nomenclatural combinations for the species.

De Candolle (1845) recognized two genera again, with *Gaertnera* comprising only Mascarene species. He also recognized two sections of *Gaertnera*, section *Aetheonoma* A. DC. with the single species *G. calycina*, and section “*Eugaertnera*” (i.e., section *Gaertnera* according to current rules of nomenclature) with the remaining 13 species. Section *Aetheonoma* was distinguished by its bracteoles paired and borne well below the base of the calyx, its broad calyx, and its anthers arranged with three alternate to the petals and two opposite them; this last condition has not been found by others (S.T.M., pers. obs.; Verdcourt, 1983). Section *Gaertnera* was characterized by having bracts borne at the base of the calyx and the anthers all alternate to the corolla lobes, with no calyx condition specified. The name “*Aethonoma*” apparently was taken from an unpublished manuscript name, “*Gaertnera aetheonoma* Steud.,” cited in synonymy with *G. calycina* by de Candolle. No valid publication of that name, as a genus or species, has been found.

As de Candolle also noted (1845: 32), Meisner had previously published the name *Fructesca mauritiana* DC. ex Meisn. for a plant that was probably a *Gaertnera*, but no description accompanied the name, thus it was not validly published and he reported that its specimen was so incomplete that its identity could not be confirmed further. There was, however, a limited description presented by Meisner for the new genus *Fructesca* DC. ex Meisn. with only one species listed in that genus, thus it can be considered validly published under our current rules. The only distinguishing characters given were a 5-lobed calyx with the lobes linear, a stipule sheath entire or usually with two incisions, and a contracted inflorescence. The calyx and inflorescence characters suggest this name might apply to *G. cuneifolia* Bojer, but the stipules of that are calyptrate and deciduous; thus, the identity of this name is still unknown.

De Candolle’s (1845) circumscription of *Gaertnera* was formally expanded first by Blume (1850), who synonymized *Sykesia* and provided names for its species in *Gaertnera*. Subsequently, Benth (1857) also synonymized *Sykesia* and recognized three sections of *Gaertnera*: sections *Aetheonoma*, “*Eugaertnera* DC.,” and *Sykesia* (Arn.) Benth. These sections were separated by calyx size and presence versus absence of villous hairs inside the corolla tube. Benth and Hooker (1876) later reduced these to

two sections separated only by corolla size: sections “*Eugaertnera*” and *Sykesia*; the classification of section *Aetheonoma* was not explained.

Schumann (1891) was the last author to recognize an infrageneric classification of *Gaertnera*, comprising sections *Aetheonoma* and “*Eugaertnera*” (i.e., section *Gaertnera*). Within section *Gaertnera* he also described two series: series *Densiflorae* K. Schum. comprised the Mascarene species with sessile flowers in congested to capitate inflorescences, and series *Laxiflorae* K. Schum. comprised species of various regions with sessile to pedicellate flowers in branched cymes. Schumann listed *G. vaginata*, the type of the genus, as a member of series *Laxiflorae*; thus, under current rules of nomenclature this is correctly called series *Gaertnera*.

The genus “*Andersonia* Willd.” was mentioned (Roemer & Schultes, 1819) only in a note to the treatment of the Neotropical genus *Exostema* (Pers.) Bonpl. This note discussed a manuscript description of one species, “*A. vaginata* Willd.,” written by Willdenow based on a plant collected by Dupetit-Thouars in Madagascar and did not mention a superior ovary. Roemer and Schultes noted that this manuscript description had been assigned a position between *Exostema* and *Solena* Willd. (hom. illeg., non *Solena* Lour.; *Solena* Willd. is equivalent to *Posoqueria* Aubl.) but that its identity was not clear; thus, those authors were not treating it as either a synonym or a recognized genus and thus were not accepting it. They also noted that this genus name had previously been used, as *Andersonia* R. Br. (Epacridaceae). Thus, Willdenow’s name cannot be considered validly published and must be regarded as a nomen nudum at best.

The monotypic Madagascar genus *Hymenocnemis* Hook. f. was described based on its combination of bilocular ovaries, calyptrate stipules, 4-merous flowers, usually 1-flowered inflorescences, unequal calyx lobes, and anthers with prominent appendages. Baker (1877) also recognized *Hymenocnemis* and suggested it was closely related to *Gaertnera*. Schumann (1891) also recognized both genera and placed them both in the tribe Psychotrieae, but did not suggest any particularly close relationships for them. The genera were also separated by Drake (1899). Recently, Malcomber and Davis (2005) reevaluated their relationship with molecular data and found *H. madagascariensis* Hook. f. deeply nested within *Gaertnera* and formally synonymized it.

Kuntze (1891) noted in his review of flowering plant nomenclature that the name *Gaertnera* had been published for other plants before the Rubiaceae genus was described and used the next available Rubiaceae name for the genus *Sykesia*. Kuntze provided

combinations for all of the then-recognized *Gaertnera* species; some of these have been noted by previous authors (van Beusekom, 1967), but others have been overlooked.

The genus *Tsiangia* But, H. H. Hsue & P. T. Li has been associated with *Gaertnera* in some lists because its sole species was originally described in this genus, *G. hongkongensis* Seem. However, Benthams (1857) noted that this name was based on a teratologically malformed specimen, and Bridson (2000) agreed and formally synonymized this name with *Ixora chinensis* Lam.

No infrageneric classifications have been accepted by recent authors and none are presented here, because despite *Gaertnera*’s broad geographic range, morphological variability, and the partial correlation of some characters with biogeographic distribution, no species groups can be clearly delimited within *Gaertnera* by either morphological or molecular characters (Fig. 3).

MORPHOLOGY

Plants of *Gaertnera* are terrestrial, usually shrubs or small trees up to 15 m tall, although a few species (e.g., *G. ternifolia* Thwaites, *G. microphylla*) are subshrubs growing to only ca. 1 m tall or the plants may be rarely clambering (e.g., *G. brevipedicellata* Malcomber & A. P. Davis, *G. cardiocarpa* Boivin ex Baill., *G. darcyana* Malcomber & A. P. Davis). Most species are found in forest understory, although several species, notably *G. obovata* Baker and some members of the *G. vaginans* complex (*G. aphanodioica* Malcomber, *G. arenaria*, *G. junghuhniana* Miq., *G. paniculata* Benth., and *G. vaginans* (DC.) Merr.) are often found in open disturbed sites such as forest edges. The plants are generally well branched, although few species (*G. obesa* Hook. f. ex C. B. Clarke, *G. monstrosa* Malcomber) are typically monocaulous. A few species produce differentiated reproductive branches with flexuous to pendulous stems and reduced leaves, often from a supra-axillary position (*G. diversifolia*, *G. inflexa* Baill.). The developmental origin of these branches is not clear from observation of whole plants and has not been investigated here. These reproductive branches vary widely in length and are not found on all plants of a species; they appear to have evolved in parallel within *Gaertnera* in Madagascar and in Southeast Asia. The bark is smooth in all species except *G. eketensis* Wernham, which has distinctive striated or fissured bark.

Plants of *Gaertnera* vary from glabrous throughout the vegetative structures and sometimes also the reproductive structures, to densely pubescent with

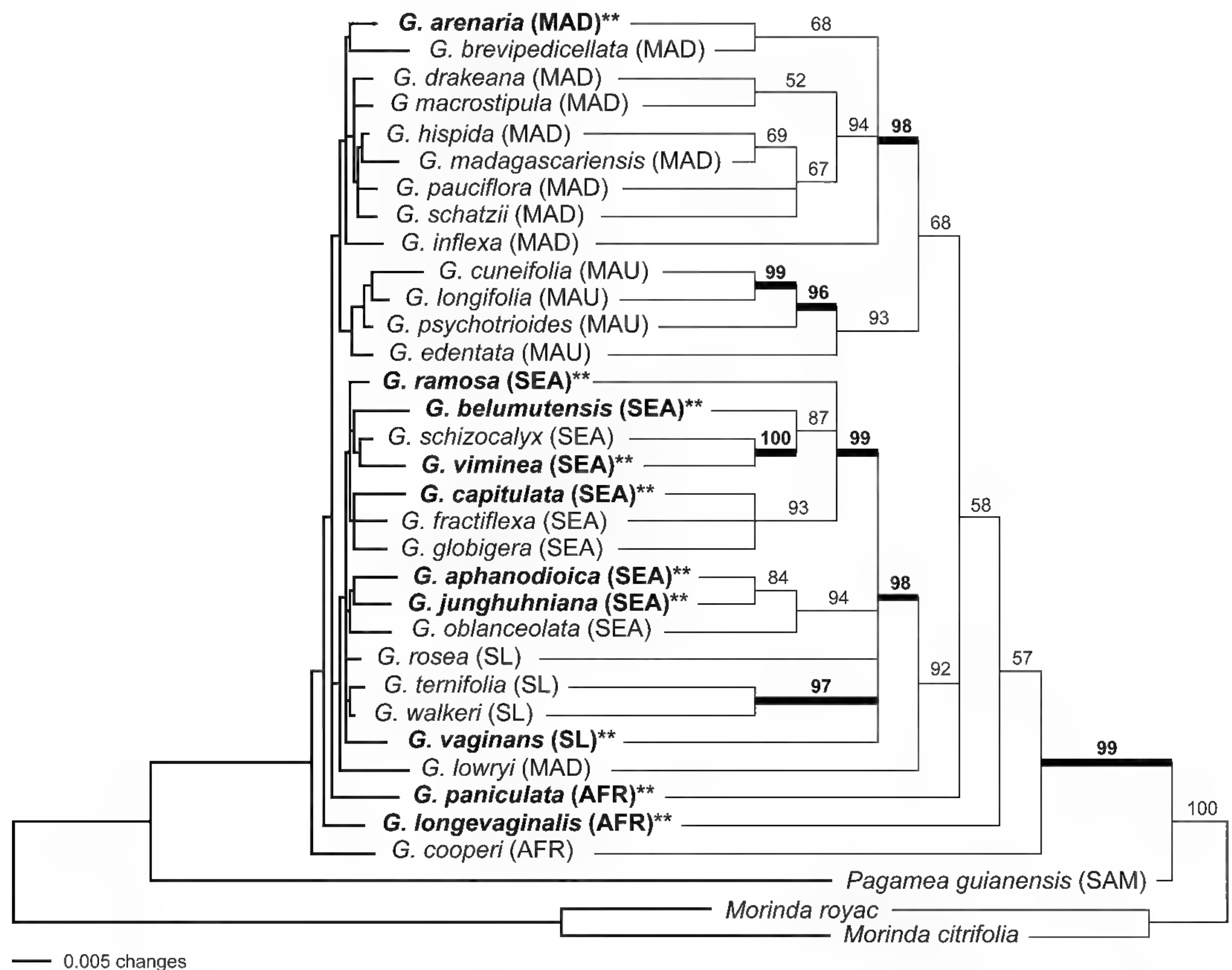


Figure 3. Bayesian consensus phylogram (left-hand side) and Bayesian consensus cladogram (right-hand side) for 31 species of *Gaertnera*, *Pagamea guianensis*, and two outgroup taxa (*Morinda citrifolia*, *M. royoc*), based on combined sequence data for ITS, *PepC-L*, and *PepC-S* using the general time reversible model and gamma-distributed rates (GTR + G); taxa analyzed and sequence information are listed in Table 1. Numbers above branches in the Bayesian consensus cladogram represent clade credibility percentages. Branches shown in bold there are considered well supported (≥ 0.95 clade credibility). Species names shown in bold with double asterisks were included in van Beusekom's (1968) broad circumscription of *G. vaginans*; see discussion in text. AFR, Africa; MAD, Madagascar; MAU, Mauritius; SEA, Southeast Asia; SL, Sri Lanka.

various types of indumentum including shortly puberulent, tomentose, pilosulose, scabrous, hirtellous, hirsute, and velutinous (sensu Lawrence, 1951). The pubescence of the petioles is not described separately here but is generally similar to that of the underside of the leaf midrib. The stems of many plants are pubescent when young but lose their vesture to become glabrescent with age. The presence, density, and type of pubescence may vary within a species (e.g., *G. trachystyla* (Hiern) E. M. A. Petit, *G. phanerophlebia* Baker), but it sometimes appears to distinguish species (e.g., *G. bieleri* (De Wild.) E. M. A. Petit vs. *G. leucothyrsa* (K. Krause) E. M. A. Petit). The pubescence colors described here are those of dried specimens; in life, the trichomes are clear or whitened. This dried color is often consistent and distinctive for individual species.

No chemical studies of *Gaertnera* have been seen, but some variation in secondary compounds is suggested by the colors and patterns found on dried specimens. In addition to the dried trichomes, in many species the entire specimen of *Gaertnera* has a characteristic brown or chestnut brown color, similar to that found in *Psychotria* subg. *Psychotria* (Hamilton, 1989). A few *Gaertnera* species have a characteristic orange drying color (*G. belumutensis* Malcomber, *G. kochummenii* Malcomber, *G. schatzii* Malcomber) that presumably is not an artifact of the specimen preparation; similar coloration is seen in individual species of other genera (e.g., *P. stenostachya* Standl.). These distinctive dried colors have been assumed to be due to characteristic secondary compounds, but no actual chemical cause is known. When the drying color is not detailed here, it is green,

dull green, brownish green, or gray-green. Many specimens of *Gaertnera* also show small inclusions, visible under $7.5\times$ magnification, in the epidermal cells of the leaves. These inclusions have a dark drying color that contrasts with the rest of the cell (or other cells); the character of these inclusions is unknown. As with other members of Rubioideae, *Gaertnera* has raphides, composed of calcium oxalate crystals, as inclusions in its tissues (Robbrecht, 1988). The wood anatomy was studied in detail by Jansen et al. (1996b).

The stems are variously terete to quadrangular or flattened, with the angled or flattened shape of the young internodes usually filling out to become cylindrical with age. Several species have distinctive longitudinal ridges or ribs that extend from the middle of the interpetiolar base of the stipule down the middle of the internode, called "interpetiolar ridges" here. This feature appears to be generally consistent within a species, although it seems to vary within a few species (e.g., *Gaertnera paniculata*). Van Beusekom (1967) noted that the data for several collections of *G. obesa* mention that the plants harbored ants, presumably in the stems. An association with ants was also noted in some populations of *G. aphanodioica* in Brunei and a population of *G. oblanceolata* in Sarawak, Malaysia, during field studies by S.T.M., with the ants accessing the stem via holes left by the removal of old branches.

The leaves are decussate and opposite or occasionally ternate (*Gaertnera ternifolia*). The arrangement seems to be consistent within a species, and the variation in this feature found in some Sri Lankan plants is considered indicative here of their hybrid origin (*G. ×gardneri* Thwaites). The leaves are subsessile to usually petiolate with a well-developed blade that varies from small and narrowly elliptic (*G. ternifolia*, $0.5\text{--}2.5 \times 0.1\text{--}0.3$ cm) to relatively large and obovate or broadly elliptic (to 55×19 cm, *G. monstrosa*, *G. obesa*). In a few species, the leaves aid in distinguishing species, but in general, as noted by van Beusekom (1967), the leaves are so similar between species that they do not present many taxonomically informative characters.

The leaf margins are entire and generally flat but may be markedly crisped (e.g., *Gaertnera ianthina* Malcomber), thinly revolute (e.g., *G. cuneifolia*), or thickened (e.g., *G. diversifolia*). The blades range from papery in texture to stiffly leathery. This character distinguishes some species; the texture described here is that of the dried leaves, which is generally correlated with the living texture. The secondary veins are generally eucamptodromous and broadly arching. Most species bear acarodomatia on the undersides of the leaves, in the axils of the secondary

veins with the costa (Robbrecht, 1988). These structures comprise small to well-developed tufts of hirtellous pubescence on the surface of the blade and sometimes also the surrounding veins ("tuft-domatia" of Robbrecht, 1988), usually situated within a shallow concavity, and additionally may be enclosed by an outgrowth of tissue of the veins ("hairy pocket-domatia") or deeply concave and surrounded by an outgrowth of tissue of the leaves ("ciliate pit-domatia" to "crypt-domatia"). *Gaertnera* species frequently have several of these forms (e.g., *G. phyllostachya* Baker); in the descriptions below, only quite uncommon domatia types are described. The presence of domatia on an individual plant (or individual specimen, at least) appears to be variable in many *Gaertnera* species.

The form of stipules of *Gaertnera* is rather unusual within the Rubiaceae and distinctive for the genus and often for a species. In all species of *Gaertnera*, the stipules are fused around the stem into a well-developed tube or sheath that is usually subtruncate except with two or four lobes. Generally, similar stipules are found in the closely related genus *Pagamea*, but as noted above, *Gaertnera* differs from *Pagamea* in the wing or rib that extends down from the stipule to encircle the base of the petiole (e.g., Figs. 4–6); the stem distal to the petiole is smooth in *Pagamea*. These ridges vary from only a little elevated (e.g., *G. sralensis* (Pierre ex Pit.) Kerr) to well-developed ridges or thin to broad wings. In a few *Gaertnera* species with relatively small stature (e.g., *G. ternifolia*, *G. walkeri* (Arn.) Blume), the stipules are persistent and relatively small and similar to those of a number of other Rubiaceae genera. However, in most *Gaertnera* species, the stipules have relatively well-developed tubular sheaths (5–75 mm long) that are caducous or quickly deciduous through fragmentation, breaking apart irregularly or occasionally leaving a persistent truncate base. Two different stipule forms are found in *Gaertnera*: tubular stipules are cylindrical with an open top in bud, so the leaves push through without damaging the sheath, which widens as the stem increases in diameter; calyptrate stipules are fully fused to form a cap covering the bud, so the expanding young stem and leaves split this structure as they push through it. Vegetative stem apices are needed to confirm the calyptrate stipule form. Both tubular and calyptrate stipules may be caducous or deciduous through fragmentation, with little evident correlation between persistence and form; only tubular stipules have been seen to regularly persist on most of the stem nodes.

In most species, the stipule sheath is cylindrical or tubular, but a few species have an inflated stipule sheath or tube that often widens toward the top to form

a funnellform or vase-like structure (*Gaertnera obesa*, *G. macrostipula* Baker). The dried texture of the stipule tube varies from membranous to leathery and is considered characteristic of individual species here. The stipule tube or sheath remains entire, or often splits along one side to form a spathaceous structure, or sometimes splits along two sides to form two segments; the pattern of splitting is described below in some detail, although as more collections of *Gaertnera* become available, this character appears to be less consistent within some species than previously thought. The top of the stipule sheath may be truncate, asymmetrically 1-lobed, or bilobed and may have variously two interpetiolar lobes or filaments, four such lobes, or no lobes. Additionally, some species bear numerous setae or short filamentous appendages (e.g., *G. bieleri*, *G. liberiensis* E. M. A. Petit, *G. hirtiflora* Verdc.); the development of these setae varies within some species, so some individual plants may have these but others not (e.g., *G. bieleri*). And, many species of *Gaertnera* have the stipules further ornamented by ridges or wings. The stipule ridges are usually four and extend or arise from the ridges or wings that encircle the petiole. In many species, these stipule ridges or ribs extend upward along the sheath to the bases of the stipule lobes, either straight up from base to apex to form corners for the somewhat quadrate sheath (e.g., *G. obovata*), or angling to fuse in the middle of the sheath and outline an ornamented triangle in the basal portion of the stipule, sometimes then extending to the top of the sheath as one rib or sometimes separating again (e.g., *G. psychotrioides* (DC.) Baker). Some species have six longitudinal ribs on the stipule sheath (*G. brevipedicellata*).

The inflorescences are usually terminal on vegetative stems but may be displaced to pseudoaxillary (Robbrecht, 1988) by subsequent growth, or they are sometimes axillary and paired (e.g., *Gaertnera oblanceolata*), terminal on relatively short branches arising from a well-developed main stem ("terminal on axillary branches"; e.g., *G. obovata*, *G. divaricata* (Thwaites) Thwaites), or terminal on flexuous, supra-axillary reproductive branches with reduced leaves (*G. diversifolia*; see discussion above). Van Beusekom (1967) diagrammed these various arrangements and postulated routes of developmental change that link them, although he posited no explanation for the supra-axillary inflorescence position. Following Robbrecht (1988), the inflorescences are considered terminal here when they are borne at the stem apex on one peduncle arising from the apical bud and also when additional inflorescence sections arise from the two axillary buds subtending the terminal bud. This latter arrangement has sometimes been called in Rubiaceae "tripartite" or "terminal and sessile." It

has also been referred to as "terminal and axillary" but is not here considered truly axillary in the sense of Robbrecht. The inflorescence position may vary within a species (e.g., *G. divaricata*), and the range of variation in this feature within a demonstrably monophyletic genus is notable.

The inflorescences are cymose or thyriform (Weberling, 1977) in arrangement, erect or sometimes pendulous (e.g., *Gaertnera trachystyla*, *G. diversifolia*, *G. pendula* Bojer), and generally dichasial in branching or, rarely, the higher-order axes may be scorpioid (*G. divaricata*). The inflorescence is usually multiflowered but may be reduced to a single flower (e.g., *G. ternifolia*, *G. madagascariensis* (Hook. f.) Malcomber & A. P. Davis) or few-flowered fascicle (e.g., *G. rosea* Thwaites ex Benth., *G. pauciflora* Malcomber & A. P. Davis), or contracted into a subcapitate head (e.g., *G. globigera*, *G. rotundifolia* Bojer) or spike (*G. spicata* K. Schum.). Van Beusekom (1967) diagrammed the various arrangements and postulated routes of development that link them. It is noteworthy that inflorescence morphology in general is homoplastic, and the hypothesized series of steps leading to the different forms is not supported by our best phylogenetic estimate for the genus. The general shape of the branched portion is usually characterized below species as corymbiform (i.e., rounded in outline), pyramidal (i.e., thyriform or paniculiform, generally conical in outline), or subglobose (i.e., congested-cymose to subcapitate). This range of variation in inflorescence arrangement is notable but similar to that found in some other Rubiaceae genera.

The inflorescences are sessile to usually pedunculate and bracteate with the bracts generally relatively small (0.1–5 mm long) but sometimes well developed (e.g., *Gaertnera cuneifolia*) and showy (e.g., *G. phyllostachya*). As in many Rubiaceae, there is often variation in the development and form of the bracts from the lower to upper nodes of the inflorescence, with the bracts "normally" shaped (i.e., reduced structures with generally elliptic to triangular shape) at the distalmost nodes but frequently resembling reduced subsessile leaves and/or reduced stipules at the basal nodes. Van Beusekom (1967) illustrated several distinctive bract forms and postulated the developmental changes that link them. The position of the bracteoles, at the base of the calyx and/or borne on the pedicel, does not appear to be taxonomically informative in *Gaertnera*, although it has been cited by some previous authors. The inflorescence axes and bracts are usually green but are attractive and bright white in a few species (e.g., *G. phyllosepala* Baker, *G. phyllostachya*). The flowers range from sessile or subsessile to usually at least shortly pedicellate.

The flowers are similar in general aspect and most details to many other Rubiaceae, except they are notable in their superior ovaries and their unusual variation in reproductive biology, which is either bisexual and heterodistylous or dioecious with the flower forms quite similar (e.g., *Gaertnera aphano-dioica*) to distinctly different (e.g., *G. junghuhniana*). Van Beusekom (1967) illustrated much of the range of variation in corolla size, pubescence, and shape, anther position, and stigma and style shape and position. The breeding biology is discussed in more detail below. The flowers vary with unusual frequency among Rubiaceae within species, between populations, and on individual plants in the number of corolla lobes and stamens. The most common condition is used here to characterize most species, as done by previous authors. Detailed measurements are provided separately here for long-styled and short-styled flowers, or pistillate and staminate flowers. These usually are combined into a single measurement in Rubiaceae treatments, on the assumption that the flowers are generally similar. However, that assumption is rarely tested in general and the variation in floral form is unusually broad in *Gaertnera*, so these measurements seem useful to present here. In most species, the flowers do seem essentially similar in the two forms, but in some species there is a small difference that may be found in future studies to be significant.

The gamosepalous calyx is generally cup-shaped and varies from relatively short and truncate or 4- to 5-denticulate or shortly 4- to 5-lobed, to well developed with relatively large, sometimes bright white, sometimes fewer lobes (*Gaertnera phyllosepala*, *G. phyllostachya*). The measurements given here for width of the calyx describe the diameter of its top at anthesis, except for species with relatively large calyx lobes that are narrowed at the base, in which the diameter given is that of the top of the unlobed portion of the calyx. The relatively well-developed calyx lobes of some species (*G. phyllosepala*, *G. phyllostachya*) correspond to the “enlarged calyx lobes” of Robbrecht (1988). They have sometimes been called “calycophylls” (Delprete, 1996), “petaloid calyx lobes,” or “semaphylls” but lack the differentiated stipe, broad blade, and relatively very large size of most such structures in Rubiaceae flowers. When present, the relatively well-developed calyx lobes may be generally equal to markedly unequal, with sometimes only one or few lobes developed on an individual flower. These enlarged calyx lobes may be developed on all the flowers of an inflorescence or only on a few flowers, and their number may vary on an individual plant (e.g., *G. phyllostachya*). The exterior of the calyx may be glabrous or variously pubescent and often is

similar in pubescence to the inflorescence axes. Its interior is usually glabrous but sometimes bears a ring of well-developed, uniform pubescence, or “hair-ring”; this structure was studied and is described for all species but does not seem to be taxonomically informative.

The corollas are salverform to funnellform at anthesis, with four or five lobes that are valvate in bud. The corollas are usually white but may be pink (e.g., *Gaertnera brevipedicellata*, *G. macrostipula*), red to orange (*G. spicata*), or blue (*G. pendula*). Corolla size in *Gaertnera* ranges from 2–30 mm long. The corollas may be glabrous (e.g., *G. pauciflora*, *G. phyllosepala*) or variously pubescent externally, and internally are usually either glabrous (e.g., *G. pauciflora*, *G. phyllosepala*) or densely villous in the upper half or third, with this pubescence sometimes extending onto the basal part of the internal or adaxial face of the lobes (e.g., van Beusekom, 1967: fig. 4). However, most of the internal faces of the corolla lobes are glabrous or, in a few species, glaucous. In most *Gaertnera* species, the corolla lobes are generally triangular to ligulate and flat, but in a few species they are thickened at the apex and prolonged into a hooked adaxial protuberance, and sometimes these apices are thickened abaxially enough to produce a sharply angled, pyramidal top to the flower bud instead of the smooth-sided, rounded to obtuse buds found in most species. *Gaertnera cooperi* is unique in its corolla lobes that are enlarged and cucullate at the apex and form a markedly enlarged and angled top on the flower bud. The corollas of *G. cooperi* are also unique within the genus in being fenestrate in the upper part of the tube. Fenestrate corolla tubes are known in several other Rubiaceae genera of various tribes and continents (Robbrecht, 1988; Piesschaert et al., 2001; but they have not been reported from *Pagamea*). The function of this corolla form is unknown.

The stamens are alternipetalous and inserted in the middle or upper part of the corolla tube, or rarely in the lower part in some small-flowered species. *Gaertnera calycina* was said (de Candolle, 1845) to have three alternipetalous anthers and the other two anthers borne opposite to the petals, but this has not been seen by us or remarked on by Verdcourt (1983), and perhaps was an artifact of the dried specimens studied. The anthers are bithecal, dorsifixed near the middle or sometimes the base, and open via lateral slits. No appendages on the connective or anthers have been seen by C.M.T., although Malcomber and Davis (2005) reported that these are found in the genus but did not mention any particular species. The size of the anthers ranges from 1.5–4 mm and is not described in detail here because it was not found to be

variable between floral forms of distylous species or to be informative for separating closely related species. The anthers may be exerted or included, and either position may be found in either flower form depending on the species. The long-styled and short-styled forms of distylous *Gaertnera* species do differ in the length of the filaments, often also in the position of the anthers (included vs. exerted), and rarely in the point of filament insertion on the corolla. The position of the anthers in each flower form of distylous species is similar to the position of the stigmas in the other form of that species. The staminodes of pistillate flowers may be reduced or similar to the stamens of the staminate flowers. The pollen was studied by Jansen et al. (1996a).

The ovary of *Gaertnera* is bilocular and secondarily superior as recently shown by Igersheim et al. (1994), with this superior position arising early in the development of the flower bud through upward intercalary growth of the ovary tissue. No *Gaertnera* species has an inferior ovary position. Igersheim et al. suggested that other Rubiaceae with superior or semi-inferior ovaries follow the same developmental pathway, but this appears not to be the case at least in another genus of Rubiaceae that was also previously placed in Loganiaceae, *Mitrasacmopsis* Jovet (Groeninckx et al., 2007). As noted above in the historical summary of the classification of this genus, the homology of this unusual ovary position has not always been interpreted correctly. The ovary is subglobose to ellipsoid and surrounded by a ring-shaped nectary. Each locule of the ovary has one erect basal ovule. The style is slender and glabrous or sometimes pubescent in the upper portion. The two stigmas are short to well developed and linear to clavate; they are sometimes reduced in staminate flowers. The long-styled and short-styled flowers differ also in the length of the style; as noted above, the position of the anthers in each floral form of distylous species is similar to the position of the stigmas in the other form of that species. The pistillodes of staminate flowers may be reduced or similar to the stigmas and style of the pistillate flowers.

The fruits of *Gaertnera* are succulent, drupaceous, globose to ellipsoid or rather didymous, and so far as observed, all black or violet-black at maturity. In a few species from Mauritius, the fruits have been reported to be whitened (Bojer, 1837), but this has not been seen by others (D. H. Lorence, pers. comm.). The fruits range in size from 4–20 × 3–16 mm, with size varying to some extent between species and also depending on the number of pyrenes produced, but as noted by van Beusekom (1967) the fruits do not show much infrageneric variation. The fruits contain one generally subglobose or two generally plano-convex

pyrenes; the number of pyrenes per fruit varies among individual flowers and is assumed to depend on pollination and other developmental factors affecting the number of ovules that develop in the individual fruits. The shape of the fruit also depends on the number of pyrenes that develop, as well as pyrene shape. The pyrene wall is elastic and “parenchyma-like” (Piesschaert, 2001), and the pyrene overall is smooth to ribbed, rugose, or deeply fissured. This form is usually visible on dried specimens because the fleshy fruit wall shrinks to the pyrene shape. Two marginal preformed germination slits and a third, median slit on the ventral surface have been seen in several *Gaertnera* species (S.T.M., pers. obs.); this is a common pattern in Rubiaceae (Piesschaert, 2001). The seed is generally elliptic to subglobose and is smooth to sometimes rugose or invaginated with ruminations that follow the shape of the pyrene wall (e.g., *G. aurea*, *G. cooperi*). These ruminations are shared with *Pagamea*, and thus considered plesiomorphic in *Gaertnera*. The endosperm is starchy.

REPRODUCTIVE BIOLOGY

The flowers of *Gaertnera* are insect pollinated, apparently mostly by bees and/or other generalist pollinators. There is apparently wide variation in pollination mode within the genus as shown by the wide range of flower size (e.g., *G. edentata* Bojer with corollas 17–35 mm long, *G. crassiflora* Bojer with corollas 38–40 mm long, *G. divaricata* with corollas 6.5–8 mm long), the variation in flower color (e.g., *G. spicata* with corollas red to orange-red, *G. edentata* with corollas white), and other aspects such as pendulous versus erect inflorescences, fenestrate versus entire corolla tubes, and truncate to large-lobed calyx limbs. The plants flower diurnally and last for a few days with usually only a few flowers open at one time on a particular inflorescence. Several species from Mauritius with relatively large, fleshy, white flowers and reportedly sweet odors (e.g., *G. edentata*, *G. hirtiflora*, *G. rotundifolia*) resemble flowers of other Rubiaceae that are nocturnal or crepuscular and may be moth pollinated; however, they are odoriferous in the middle of the day (D. H. Lorence, pers. comm.). The distylous species are protandrous.

The fleshy, drupaceous fruits of *Gaertnera* are presumably similar to those of other Rubiaceae in being bird dispersed; however, no active dispersal of *Gaertnera* fruits was observed during this study, and no published dispersal observations have been found.

Gaertnera is either distylous (Fig. 2) or dioecious (Fig. 4; Malcomber, 2000, 2002). Van Beusekom (1967) suggested that some plants of *G. vaginans* are homostylous and bisexual, but this has not been

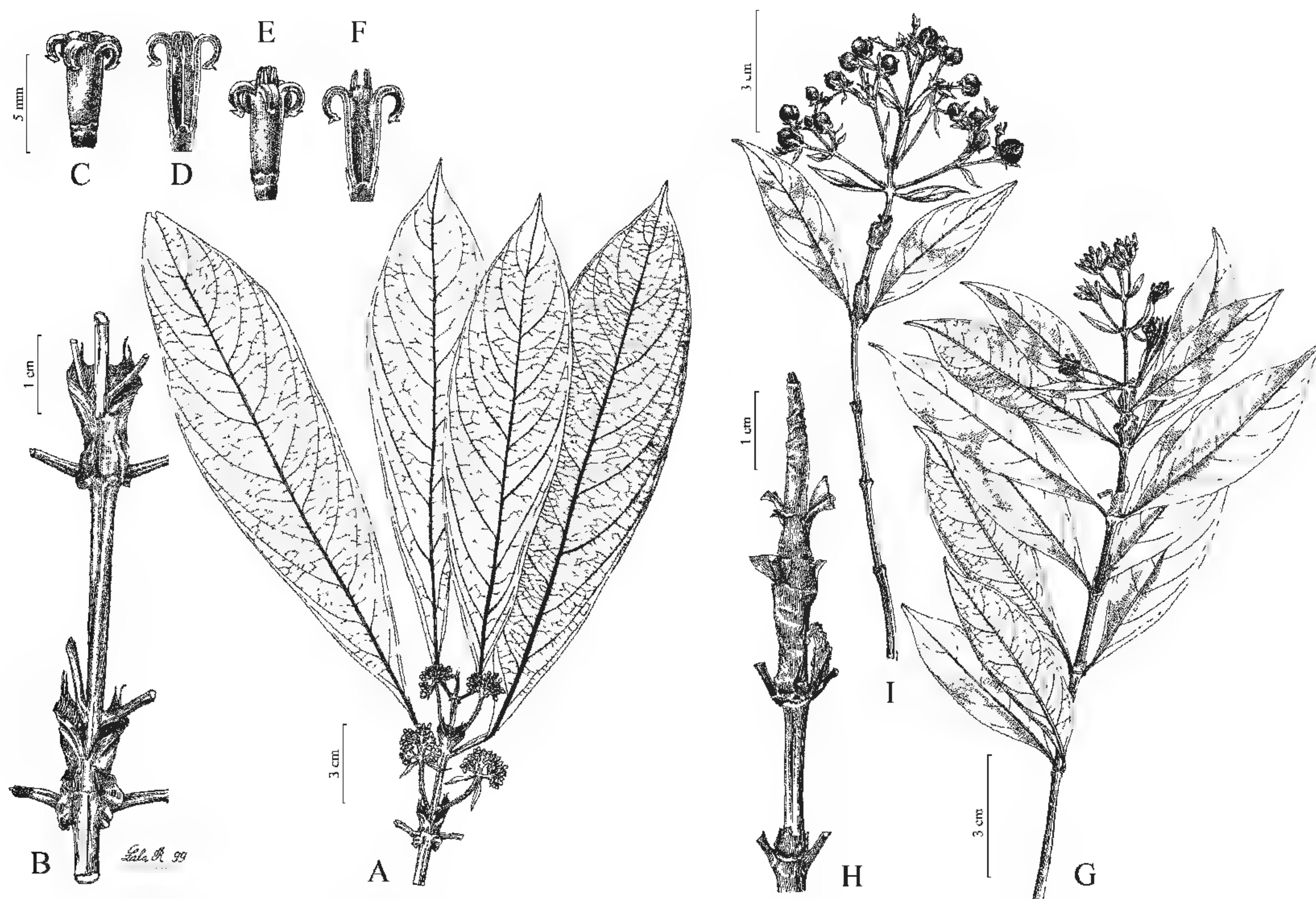


Figure 4. A–F. *Gaertnera oblanceolata* King & Gamble. —A. Flowering branch. —B. Portion of stem with petiole bases and stipules. —C. Pistillate flower. —D. Pistillate flower in cross section. —E. Staminate flower. —F. Staminate flower in cross section. G–I. *Gaertnera raphaelii* Malcomber. —G. Flowering branch. —H. Portion of stem with petiole bases, stipules, and stem apex. —I. Fruiting branch. C–F to same 5-mm scale. A–F based on *Malcomber 3039*; G–I based on *Malcomber 2875*.

confirmed by us. *Gaertnera aphanodioica* (Fig. 5A–F) is notable in being morphologically apparently homostylous, but functionally dioecious based on pollination studies by S.T.M. in Berakas Forest Reserve, Brunei, in 1998; collections from this population were regarded by van Beusekom (1967) as hermaphroditic and homostylous forms of *G. vaginans*. All the other species for which breeding biology is known are either evidently dioecious or distylous. The breeding biology of several species cannot be determined from the information available; such species from Africa, Madagascar, the Mascarene Islands, and Sri Lanka are presumed to be probably distylous, and the unknown species from southeastern Asia are expected to be eventually demonstrated to be dioecious. The evolutionary aspects of the breeding biology of *Gaertnera* are discussed further below.

BIOGEOGRAPHY, HABITAT, AND DISTRIBUTION

As circumscribed here, species of *Gaertnera* are regional endemics in Sri Lanka (five species and one hybrid), southeastern Asia (16 species), Africa (12 species), Madagascar (26 species), and the Mascarene Islands (nine species in Mauritius, one species in Réunion). Accordingly, regional keys are presented to

the species of the genus. The relationships among the species are not entirely clear (Malcomber, 2002), but the geographic patterns suggest the genus has a history of radiation within newly colonized regions, especially on islands such as Madagascar, Mauritius, Sri Lanka, and Borneo. Robbrecht (1996), in his survey of African Rubiaceae biogeography, characterized *Gaertnera* in the category of “12 Paleotropical Genera, 122 mainly present in Africa and/or Madagascar,” apparently based in large part on the work of Petit (1959a) and van Beusekom (1967). More species are recognized here in all of these regions but particularly in Asia.

Within a particular biogeographic region, the *Gaertnera* species for which information is available show a consistent breeding biology, distylous through most of the range of the genus and dioecious in Southeast Asia. Van Beusekom (1967) recognized species of broad geographic range with mixed distylous-dioecious breeding biology, but these circumscriptions are not supported by the data or the species descriptions on which this treatment is based, as discussed in detail below for the *G. vaginans* complex.

The 12 African species of *Gaertnera* are found from Senegal in the northwestern part of the continent to

Zambia in its central southeastern region, from sea level to 1720 m (Fig. 1). The most widespread species is *G. paniculata*, which is found throughout this range. Most of the species are restricted to West or Central Africa, and most are found below 1000 m elevation. Presumably, the apparently disjunct distributions of species that appear to “jump over” some countries are artifacts of limited specimen representation rather than the actual range (e.g., *G. longivaginalis* (Schweinf. ex Hiern) E. M. A. Petit documented in the Democratic Republic of the Congo, Cameroon, and Angola but not Gabon). In the phytogeographic classification of Takhtajan (1986), *Gaertnera* is found in the Guineo-Congolian and Sudano-Zambesian regions, with all of its African species found in the first region and two additionally ranging into the second. In the more detailed phytogeographic classification of White (1993), all 12 of the African species of *Gaertnera* are found in the “Guineo-Congolian regional centre of endemism,” with 10 species restricted to this region, while the other two species also range into the “Guineo-Congolia/Sudania regional transition zone” (*G. longivaginalis*, *G. paniculata*) and the “Guineo-Congolia/Zambesia regional transition zone” (*G. longivaginalis*, *G. paniculata*), and only *G. paniculata* further ranges into the “Sudanian” and “Zambeian regional centres of endemism.” The species that are only found in the “Guineo-Congolian regional centre of endemism” are all further restricted to the west (*G. aurea*, *G. cooperi*, *G. liberiensis*) or east (*G. bieleri*, *G. eketensis*, *G. gabonensis* Malcomber, *G. letouzeyi* Malcomber, *G. leucothyrsa*, *G. spicata*, *G. trachystyla*) of the Dahomey Gap. Some changes to White’s phytogeographic classification have subsequently been proposed, but as detailed by Friis (1998), these affect mainly the Afromontane regions and do not touch on the African range of *Gaertnera*. Robbrecht (1996) recognized several generic distribution patterns of African Rubiaceae; *Gaertnera* generally agrees with his “Africa-wide” distribution except it is not present in East Africa.

In Asia, six species of *Gaertnera* and one presumed natural hybrid are restricted to Sri Lanka, while 16 species are found in southeastern continental Asia, Borneo, and Sumatra (Fig. 1). On Sri Lanka, *Gaertnera* is found at 50–2000 m elevation in wet evergreen forests, generally in the southwestern and central part of the island; *G. vaginans* is the most commonly collected species. Sri Lanka was classified phytogeographically by Takhtajan (1986) in the Indian region, which he considered a separate region from southeastern Asia. In southeastern Asia, *Gaertnera* ranges from sea level to 2750 m elevation, and 14 species are restricted to the region of Peninsular Malaysia,

Borneo, and Sumatra, classified by Takhtajan in the Malesian region. *Gaertnera junghuhniana*, the most commonly collected species in this region, is mainly distributed in the Malesian region but is also found in peninsular Thailand, which Takhtajan classified as part of the adjacent Indochinese region; in contrast, *G. sralensis* is mainly distributed in the Indochinese region but is also found in Peninsular Malaysia in the Malesian region.

Gaertnera has its center of species richness (as well as morphological diversity) in Madagascar and the Mascarene Islands (Fig. 1), which phytogeographically comprise most of the Madagascan region of Takhtajan (1986). Here, *Gaertnera* is found mainly on Madagascar (26 or possibly 27 species) but is also well represented on Mauritius (nine species) and Réunion (one common species), with all the species currently each known from a single one of these islands. Several species of *Gaertnera* of Mauritius may have grown in Madagascar in historical times (e.g., *G. crassiflora*), or these reports may be labeling errors. On Mauritius, *Gaertnera* species are found in wet forests and heathlike, “groundwater laterite” vegetation at 50–800 m, with *G. psychotrioides* the most commonly collected species. *Gaertnera vaginata* is the only species known from Réunion, where it grows in wet forests at 50–1800 m.

The geological substrates of Madagascar were mapped and included in vegetation analyses by Du Puy and Moat (1998, 2003); *Gaertnera* species in Madagascar are generally found on metamorphic and igneous basement rocks, except a few species that grow additionally to exclusively on sedimentary substrates such as alluvial deposits (e.g., *G. mada-gascariensis*) or unconsolidated sands (e.g., *G. guillotii* Hochr.). Du Puy and Moat also classified the vegetation types of Madagascar; *Gaertnera* is found here in evergreen humid forests, which are distributed along the entire eastern part of the island, through the east-central highlands region (although very little natural vegetation remains here) and westward through the mountainous northern region. *Gaertnera* grows in Madagascar at 0–2000 m, in Du Puy and Moat’s “coastal forest (eastern),” “evergreen, humid forest: low altitude,” “evergreen humid forest: mid altitude,” and “evergreen humid forest: lower montane” zones. A few *Gaertnera* species here are found only at ca. 300 m elevation or below (*G. cardiocarpa*, *G. drakeana* Aug. DC., *G. hispida* Aug. DC., *G. schatzii*), but most of the species are found at higher elevations. By far, the most commonly encountered species is the widespread, morphologically variable *G. obovata*, in particular its variety *sphaerocarpa* (Baker) Malcomber. As noted by Davis and Bridson (2003), *Gaertnera* is one of the most commonly encountered

genera of Rubiaceae in mature, well-preserved forests, although it is not often found in secondary vegetation and this is not a relatively species-rich Rubiaceae genus in Madagascar. Gautier and Goodman (2003) recently reviewed the phytogeography of Madagascar and noted that although the island's flora is known for its high degree of endemism, Paleotropical genera such as *Gaertnera* as well as pantropical genera also comprise an important part of the flora. Gautier and Goodman recognized five phytogeographic regions; *Gaertnera* is found in three of these: the Eastern region, the Central region, and the Sambirano region. Several *Gaertnera* species are restricted to only one of these regions and are known from only a small range here within the respective region (e.g., *G. schatzii*, *G. brevipedicellata*, *G. bambusifolia* Malcomber & A. P. Davis), while a few species are found in all three of these regions (e.g., *G. obovata*).

DIVERSIFICATION AND EVOLUTION IN THE GENUS

PHYLOGENETIC RELATIONSHIPS AND ORIGIN OF *GAERTNERA*

The Bayesian phylogenetic analysis of 31 *Gaertnera* species with *Pagamea guianensis* and two *Morinda* species as outgroups estimated a well-supported (99% posterior probability [PP]) *Gaertnera* clade, but only seven well-supported (> 95% PP) clades within the genus because of limited nucleotide sequence divergence among sampled species in the ITS, *PepC*-L, and *PepC*-S data sets. *Gaertnera cooperi* is estimated as sister to all other sampled species, followed by another African species, *G. longivaginalis*. The position of the remaining sampled African species, *G. paniculata*, is unresolved in a clade containing sampled species from Madagascar, Mauritius, Southeast Asia, and Sri Lanka. A well-supported clade of Malagasy species (98% PP), excluding *G. lowryi* Malcomber, is found to be sister to a clade of sampled Mauritian species. *Gaertnera lowryi* is found to be sister to a well-supported clade of all the sampled Southeast Asian and Sri Lankan species, suggesting that the progenitor of the Sri Lankan and Southeast Asian species originated in northeastern Madagascar (e.g., the Masoala Peninsula). However, this sister relationship is not well supported (92% PP), so additional characters and *Gaertnera* species will need to be included to test this hypothesis. Sampled Southeast Asian species from Peninsular Malaysia, Singapore, and western Sarawak form a well-supported clade (99% PP) that is unresolved relative to the other Sri Lankan and Southeast Asian species. Sampled Sri Lankan species do not form a single clade, although a well-supported (97% PP) sister relationship is estimated between *G. ternifolia* and *G. walkeri*.

Similar to the results of Malcomber (2002) and Malcomber and Davis (2005) with data sets with common nucleotide sequence data, our phylogenetic analysis estimated an African origin for *Gaertnera* followed by a limited number of dispersal events from Africa to Madagascar, Madagascar to Mauritius, and Madagascar to Sri Lanka/Southeast Asia. Molecular clock analyses estimated that these dispersal events and radiation of the genus occurred within the last 5–5.5 million years (Malcomber, 2002).

MORPHOLOGICAL AND REPRODUCTIVE DIVERSIFICATION

Gaertnera is notable in Rubiaceae and also in the higher plants in the plasticity of morphology and breeding systems within a group of closely related, relatively recently derived species. The phenological plasticity and the varied directions in which selection has pushed it are remarkable for both the range and number of novelties (e.g., the fenestrate corollas of *G. cooperi*, the spiciform inflorescence of *G. spicata*, the enlarged calyx lobes of *G. phyllostachya*) and the repeated derivation of unusual morphological features in species of different regions (e.g., the relatively large campanulate stipules of *G. obesa* and *G. monstrosa*; the pendulous supra-axillary inflorescences bearing reduced leaves of *G. inflexa* and *G. diversifolia*). It should also be noted that several morphological features do not vary in *Gaertnera* as much as in some other Rubiaceae genera of comparable size, in particular number of ovary locules and stigmas, corolla and fruit colors, and the size of the plants (all *Gaertnera* species are small trees or shrubs up to 15 m tall).

Notable morphological variation in *Gaertnera* includes leaf size, which ranges from 0.5–60 cm long, and stipule form. The stipules are always united into at least a short sheath, but are variously membranous to coriaceous, calyptrate to tubular or funnellform, and caducous to persistent, with only the basal portion to the entire stipule persisting. The stipule tube is variously ridged, ornamented with ribs and/or well-developed wings, or smooth, and the stipule apex is entire, lobed, possessing a combination of lobes and setae, or with only setae. Most *Gaertnera* species have terminal inflorescences borne on principal branches, but *G. inflexa*, *G. diversifolia*, *G. oblanceolata*, and *G. divaricata* have inflorescences on axillary or supra-axillary branches. Inflorescence arrangement varies from corymbiform-cymose to lax and thyrsiform, capitate, or reduced to a few-flowered cyme or solitary flowers. Calyx lobes are usually relatively small and deltate to linear, but are sometimes filiform or expanded into petaloid white structures that function to attract pollinators. The corollas are generally white

in all but one species, and range in size from 2–30 mm long.

Species of *Gaertnera* appear to hybridize, in some cases perhaps frequently, as in some other Rubiaceae genera (e.g., *Cinchona* L.; Andersson, 1998). In particular, a distinctive group of plants that have long been regarded as a separate species are considered a hybrid here, *G. ×gardneri*, which is intermediate but somewhat variable in characters and grows in the contact zone of its two presumed parents, *G. ternifolia* and *G. walkeri*, on Adam's Peak. Several species from Madagascar also appear to hybridize (e.g., *G. phanerophlebia*, *G. humblotii* Drake). Whether these hybrids are fertile is unknown; if so, this process may be part of the reason for the diversification and close species relationships seen in *Gaertnera*.

As discussed above and elsewhere (Malcomber, 2002), species of *Gaertnera* may be either dioecious or distylous, and the genus is also one of only nine reported cases in which dioecy has apparently followed a predicted pathway and evolved from distylous ancestors (Muenchow & Grebus, 1989).

The available evidence—biogeography, molecular sequence data, and morphology—shows that this notable morphological diversity has evolved relatively rapidly and also that several unusual features of individual *Gaertnera* species have evolved more than once, in parallel, within the genus, in different regions presumably in response to similar selection pressures. Thus, *Gaertnera* provides an example of the ways in which tropical Rubiaceae have diversified, shows the dynamic environment in which tropical plants live, and provides an object lesson for systematists about the nature and “informativeness” of both morphological and molecular characters.

THE *GAERTNERA VAGINANS* COMPLEX

Van Beusekom (1967), in his revision of Asian *Gaertnera*, adopted a broad species concept. In particular, he circumscribed *G. vaginans* as one widespread, morphologically and biologically variable species with two subspecies and included in it plants of Africa, Madagascar, Sri Lanka, and Southeast Asia with cylindrical stipules that closely encircle the stems, subcapitate to diffusely cymose inflorescences, 5-merous flowers, reduced calyx lobes, and variously distylous, homostylous, and dioecious breeding systems. His subspecies *vaginans* comprised all the distylous plants of this group and all the plants of Africa, Madagascar, and Sri Lanka; his subspecies *junghuhniana* (Miq.) Beusekom comprised all the dioecious plants of this group and all the plants of Southeast Asia including Borneo and the Indonesian archipelago. Thus, van Beusekom's circumscription of

G. vaginans resulted in a single species that was distinguished by a set of characters that are widespread and perhaps ancestral within the genus. His *G. vaginans* additionally was distributed across several broad biogeographic regions and notably polymorphic in breeding system, and thus questionable as to the reproductive cohesion of the regional populations.

Such broadly diagnosed widespread taxa that are morphologically similar in a general way yet polymorphic in several features are recognized in most taxonomic studies of plant groups. Such polymorphic taxa are sometimes recognized when the observed morphological variation is not considered significant (e.g., Vink [1970] grouped 39 local “entities” into a broadly circumscribed *Drimys piperita* Hook. f. [Winteraceae]), and sometimes they result from a lack of data adequate to support further subdivision within the group (e.g., Maldonado [2005] reduced half the previously described species of *Elaeagia* Wedd. [Rubiaceae] to synonymy based on a principal coordinates analysis of characters of individual specimens that failed to distinguish diagnosable groups; Andersson [1998] recognized several broadly circumscribed, variable species of *Cinchona* diagnosed by a unique combination of common characters of the genus). Alternatively, such morphologically variable sets of plants are sometimes treated as numerous narrowly circumscribed species, in some cases linked by intermediate or presumed hybrid specimens (e.g., Andersson [1998] also recognized several morphologically well-marked, geographically restricted *Cinchona* species among populations previously included in other species, and listed intermediate specimens).

White (1998) addressed this situation and described such widespread polymorphic taxa as ochlo-species, a term he defined as: “A very variable (polymorphic) species, whose variation, though partly correlated with ecology and geography, is of such complex pattern that it cannot be satisfactorily accommodated within a formal classification.” Cronk (1998) reviewed several cases that can be considered ochlo-species, compiled a list of 10 traits that characterize and help recognize ochlo-species, and concluded that it is not always clear which are phenotypically plastic species and which result from the synthesis of inadequate data.

Gaertnera vaginans as circumscribed by van Beusekom (1967) has several of the traits of ochlo-species identified by Cronk; in particular, it is geographically and ecologically widespread; its character states seem to be only partially correlated with geography; similar variants appear to be found in widely separated localities; and it has a long taxonomic synonymy. Characterizing van Beusekom's

G. vaginans as an ochlopecies suggests that it deserves reconsideration and that additional data are needed for this. Here, this is reviewed using molecular data incorporated with newly compiled morphological data based on additional collections made since 1968, and a different, more closely defined species concept (outlined in the Methods section).

The molecular sequence data indicate that plants of van Beusekom’s “*Gaertnera vaginans*” do not form a single clade, but instead are a polyphyletic group with members distributed among several of the clades within *Gaertnera* (Fig. 3). This supports the classification based on morphology, which separates van Beusekom’s “*G. vaginans*” into 12 species, each with more limited geographic distribution and morphological variation (Table 2), with five of these newly described here: *G. alstonii* Malcomber, *G. aphanodioica*, *G. arenaria*, *G. belumutensis*, *G. capitulata*, *G. junghuhniana*, *G. kochummenii*, *G. longivaginalis*, *G.*

paniculata, *G. ramosa* Ridl., *G. sralensis*, and *G. vaginans*. A key to the species recognized within this group is presented below.

The majority of these species are found in Southeast Asia, where van Beusekom’s study was focused; thus, the morphological variation that was problematic for this classification is indeed greatest in this region, although *Gaertnera arenaria* of Madagascar as circumscribed here is also widely variable and perhaps represents an ochlopecies on a smaller scale (resolution of this is beyond the scope of the present work). Thus, in this case the addition of more data leads to the segregation of this polymorphic taxon into more numerous and more narrowly delimited species that are more comparable in their distinguishing features and variability to other species of *Gaertnera*, and thus more broadly testable across the genus. This new classification better elucidates some of the evolutionary radiation within *Gaertnera*.

KEY TO SPECIES OF THE *GAERTNERA VAGINANS* COMPLEX

- 1a. Stems and stipules pilosulose to hirtellous, tomentulose, and villous or stipules sometimes puberulent; plants dioecious.
 - 2a. Leaves elliptic-oblong to oblanceolate or elliptic; inflorescence corymbiform; peduncles 3–5 cm long; Borneo 2. *G. alstonii*
 - 2b. Leaves elliptic to oblanceolate; inflorescence subglobose, sessile or with peduncles to 1.4 cm long; Borneo 11. *G. capitulata*
- 1b. Stems and stipules glabrous or puberulent, or stipules sometimes pilosulose in *G. longivaginalis*; plants distylous or dioecious.
 - 3a. Inflorescences subglobose, sessile or with peduncles to 3.5 cm long.
 - 4a. Plants drying with green to grayish green cast; continental Southeast Asia 64. *G. sralensis*
 - 4b. Plants drying with orange cast.
 - 5a. Calyx truncate or with lobes to 0.3 mm long; continental Southeast Asia 7. *G. belumutensis*
 - 5b. Calyx lobes 1–3.5 mm long; continental Southeast Asia 35. *G. kochummenii*
 - 3b. Inflorescences corymbiform to pyramidal, sessile or with peduncles to 6 cm long.
 - 6a. Plants dioecious, with unisexual flowers (flowers appearing homostylous in *G. aphanodioica*).
 - 7a. Stipules drying membranous, with lobes 1–2.5 mm long; inflorescences several-flowered, with ca. 5 to 10 flowers; continental Southeast Asia 57. *G. ramosa*
 - 7b. Stipules drying chartaceous, with lobes 1–7 mm long; inflorescences many-flowered, with more than 10 flowers.
 - 8a. Corolla white, tube 6–9 mm long; Borneo 3. *G. aphanodioica*
 - 8b. Corolla pale green to white, tube 2.5–5 mm long; continental Southeast Asia . . . 34. *G. junghuhniana*
 - 6b. Plants distylous, with bisexual flowers.
 - 9a. Stipules drying membranous, with lobes 1–8 mm long; corolla tube 4–6 mm long; West and Central Africa 40. *G. longivaginalis*
 - 9b. Stipules drying chartaceous, with lobes 0.5–5 mm long.
 - 10a. Corolla tube 3–4 mm long, externally densely puberulent or tomentose; stipule lobes 0.5–1.2 mm long; West and Central Africa 50. *G. paniculata*
 - 10b. Corolla tube 4–16 mm long, externally glabrous, scabrous, or sparsely puberulent; stipule lobes 0.5–5 mm long.
 - 11a. Corolla tube 10–16 mm long; stipule lobes 2.5–5 mm long; Madagascar . . . 4. *G. arenaria*
 - 11b. Corolla tube 4–6 mm long; stipule lobes 0.5–2.5 mm long; Sri Lanka 67. *G. vaginans*

TAXONOMIC TREATMENT

Gaertnera Lam., Tabl. Encycl. 1: 379, t. 167, 13 Feb. 1792, nom. cons., non *Gaertnera* Schreb., 1789, nom. rej., Malpighiaceae; nor *Gaertneria* Medik., 1798, nom. rej., Asteraceae; nor *Gaertneria* Neck., 1789, nom. inval., Gentianaceae; nor *Gaertnera* Retz., 1791, nom.

rej., Campanulaceae. TYPE: *Gaertnera vaginata* Lam.

Sykesia Arn., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 18: 351. 1836. *Gaertnera* subg. *Sykesia* (Arn.) Benth., J. Proc. Linn. Soc. 1: 112. 1857. TYPE: *Sykesia koenigii* Arn., nom. illeg. superfl. — *Gaertnera vaginans* (DC.) Merr.
Frutesca DC. ex Meisn., Pl. Vasc. Gen. 1: 259, 2: 168. 1840. TYPE: *Frutesca mauritiana* DC. ex Meisn.

Table 2. Contrasting taxonomic treatments of *Gaertnera vaginans* (DC.) Merr. s.l.

Character states of Malcomber										Taxonomic treatments	
Breeding system	Plant drying orange or yellow?	Leaf shape	Leaf pubescent or glabrous?	Stipule wings prominent?	No. of flowers per inflorescence and shape	Calyx lobe shape	Corolla length	Anthers and stigma equal?	Malcomber (2004)	van Beusekom (1967)	
Dioecious	yes	oblong	pubescent	yes	many, domed	triangular, small	mature corolla unknown		<i>Gaertnera alstonii</i>	<i>G. vaginans</i> subsp. <i>junghuhniana</i>	
Dioecious	no	elliptic-ob lanceolate	glabrous	no	many, domed	+ truncate	6–8 mm long	yes	<i>G. aphanodioica</i>	<i>G. vaginans</i> subsp. <i>junghuhniana</i>	
Dioecious	yes	elliptic	glabrous	no	many, globose	+ truncate	mature corolla unknown		<i>G. belumutensis</i>	<i>G. vaginans</i> subsp. <i>junghuhniana</i>	
Dioecious	no	elliptic to ob lanceolate	pubescent	yes	many, globose	triangular, small	7.5–8.5 mm long	no	<i>G. capitulata</i>	<i>G. vaginans</i> subsp. <i>junghuhniana</i>	
Dioecious	no	linear, lanceolate-ob lanceolate	usually glabrous	no	few or many, domed	+ truncate	2.5–5 mm long	no	<i>G. junghuhniana</i>	<i>G. vaginans</i> subsp. <i>junghuhniana</i>	
Unknown	yes	elliptic	pubescent	no	many, domed	ovate, prominent	mature corolla unknown		<i>G. kochummenii</i>	<i>G. vaginans</i> subsp. <i>junghuhniana</i>	
Dioecious	no	elliptic-ob lanceolate	glabrous	no	few, domed	+ truncate	5–10 mm long	no	<i>G. ramosa</i>	<i>G. vaginans</i> subsp. <i>junghuhniana</i>	
Dioecious	no	elliptic	glabrous	no	few to many, globose	triangular	3–4 mm long	no	<i>G. sralensis</i>	<i>G. vaginans</i> subsp. <i>junghuhniana</i>	
Distylous	no	elliptic to oblong	glabrous	no	many, conical	+ truncate	10–16 mm long	no	<i>G. arenaria</i>	<i>G. vaginans</i> subsp. <i>vaginans</i>	
Distylous	no	elliptic to ob lanceolate	glabrous	no	few or many, domed	linear, up to 5 mm long	4–6 mm long	no	<i>G. longivaginalis</i>	<i>G. vaginans</i> subsp. <i>vaginans</i>	
Distylous	no	oblong to elliptic	glabrous	no	many, domed	+ truncate	2.5–4 mm long	no	<i>G. paniculata</i>	<i>G. vaginans</i> subsp. <i>vaginans</i>	
Distylous	no	elliptic to obovate	glabrous	no	many, conical or domed	+ truncate	4–5.5 mm long	no	<i>G. vaginans</i>	<i>G. vaginans</i> subsp. <i>vaginans</i>	

Gaertnera sect. *Aetheonoma* A. DC., Prodr. 9: 34. 1845.
Aetheonoma Meisn. ex Steud., Nomencl. Bot., ed. 2,
651. 1841, nom. nud., pro syn. TYPE: *Gaertnera*
calycina Bojer.

Pristidia Thwaites, Enum. Pl. Zeyl. 2: 149. 1859. TYPE:
Pristidia divaricata Thwaites — *Gaertnera divaricata*
(Thwaites) Thwaites.

Hymenocnemis Hook. f., in Benth. & Hook. f., Gen. Pl. 2:
132. 1873. TYPE: *Hymenocnemis madagascariensis*
Hook. f. — *Gaertnera madagascariensis* (Hook. f.)
Malcomber & A. P. Davis.

Gaertnera ser. *Densiflorae* K. Schum., Nat. Pflanzenfam. 4(4):
124. 1891. TYPE: *Gaertnera crassiflora* Bojer.

Gaertnera ser. *Laxiflorae* K. Schum., Nat. Pflanzenfam. 4(4):
124. 1891, nom. illeg. TYPE: not designated. (This
series explicitly included the type species of the genus,
and thus is correctly called *Gaertnera* ser. *Gaertnera*.)

Trees or shrubs, up to 15(–20) m tall, glabrous to variously pubescent, sometimes drying grayish green, brown, gray, chestnut, reddish brown, or with a distinctive orange cast. *Branches* flattened to terete or quadrangular, 0.5–15 mm diam.; internodes 0.1–26 cm, smooth or with 2 to 4 longitudinal ribs, sometimes corky (*Gaertnera alata* Bremek. ex Malcomber & A. P. Davis). *Leaves* sessile to petiolate, decussate, paired or rarely ternate, isophyllous to slightly anisophyllous; blade 0.5–55 × 0.1–20 cm, linear-lanceolate to elliptic, elliptic-oblong, or cuneiform, margins flat or infrequently crisped; secondary veins visible or sometimes not visible abaxially, eucamptodromous, spreading and arched or infrequently nearly straight and ascending at an acute angle; domatia absent or present as pilosulose or hirtellous, tuft- or crypt-domatia in axils of secondary veins; petioles 0.2–10 cm, smooth to occasionally furrowed or rarely winged, smooth or usually encircled on sides and below by ridges or wings, these often extending onto stipules. *Stipules* 0.1–75 mm, tubular and open at top in bud to fused at top and calyptrate, cylindrical to infrequently funnel-shaped, entire or splitting along 1 side to form a spathaceous structure, splitting on 2 sides to form 2 usually intrapetiolar segments, or rarely splitting on 4 sides into 4 spatulate parts (*G. furcellata* (Baill. ex Vatke) Malcomber & A. P. Davis, *G. microphylla*), drying membranous to coriaceous, variously caducous, deciduous through fragmentation, or persistent, usually with 4 longitudinal ribs or wings arising below petioles and extending along sheath to lobes, sometimes with 2 additional ribs or wings; apex entire or with the 1 to 4 incisions described above, marcescent (i.e., becoming hardened) to fragmenting or infrequently persistent; lobes none or 4, up to 20 mm, deltate to filiform; additional setae none or several to numerous, to 20 mm. *Inflorescences* terminal on developed stems, sometimes borne on short axillary stems, or rarely axillary or terminal on supra-axillary stems, cymose to compound-cymose, paniculi-

form, subcapitate, reduced to 1 or a few flowers, or rarely spiciform, erect to occasionally pendulous, sessile to pedunculate, green, white, or pink, bracteate or rarely ebracteate (*G. alata*); peduncle to 15 cm; branched portion up to 25 × 30 cm, pyramidal to corymbiform-rounded, subglobose, or rarely cylindrical, branched to as many as 6 orders, lax to congested; axes dichasial or rarely scorpioid (*G. divaricata*); bracts subtending basalmost axes triangular to linear or sometimes resembling reduced leaves or stipules (*G. microphylla*), rarely grouped into an involucre (*G. cuneifolia*, *G. microphylla*); bracts subtending higher-order axes up to 30 mm, deltate to linear, ovate, or trifid, usually grading in size and shape between basalmost bracts and bracteoles; bracteoles reduced to developed, inserted on pedicel and/or at base of calyx, rarely enlarged and bright white (*G. phyllosepala*, *G. phyllostachya*). *Supra-axillary* reproductive branches rarely present (*G. diversifolia*, *G. inflexa*), paired, flexuous, with leaves well developed to reduced. *Flowers* sessile to pedicellate, 4- to 5(6)-merous, dioecious or bisexual and heterodistylous. *Calyx* limb cup-shaped, urceolate, or campanulate, 1–20 mm wide, outside glabrous or variously pubescent, inside sometimes with a distinct ring of trichomes, truncate to denticulate or lobed, lobes rounded to triangular or linear, equal to markedly unequal, up to 30 mm, sometimes petaloid in color and texture (*G. phyllosepala*, *G. phyllostachya*); corolla white or infrequently pink, red, orange, or blue, clavate to rhomboidal or obclavate in bud, at anthesis salverform, infundibuliform, or campanulate, 2–30 mm, outside glabrous or variously pubescent, inside glabrous or villous inside tube, tube entire or rarely fenestrate (*G. cooperi*), lobes 1–10 mm, narrowly triangular to ovate-oblong, glabrous adaxially, apically rounded to acute or rarely expanded and cucullate (*G. cooperi*), abaxially smooth or rarely with a thickened subapical appendage (*G. edentata*); stamens inserted in corolla tube, anthers 1.5–4 mm, narrowly oblong, dithecal, dehiscent by longitudinal slits, sessile or with developed filaments to 8 mm, in long-styled flowers positioned below the stigmas and included to partially exserted, in short-styled flowers positioned above the stigmas and included to exserted, in staminate flowers positioned near middle of corolla tube to exserted, in pistillate flowers staminodes present or absent, positioned in lower part of corolla to corolla throat. *Ovary* superior, 2-locular, 2-celled, with 1 erect basal ovule in each cell; style filiform, glabrous or pubescent, stigmas 2, linear-clavate, often flattened, in long-styled flowers these positioned above the anthers and exserted, in short-styled flowers these positioned below the anthers and included, in staminate flowers pistillodes developed or reduced and positioned in lower part to middle

of corolla tube, in pistillate flowers these developed and positioned in lower to upper part of corolla tube. *Fruit* a drupe, blue to violet-black or reportedly sometimes whitened, globose to ellipsoid, obovoid, or didymous, smooth or infrequently ridged, 5–28 × 5–16 mm, glabrous or rarely pubescent; pyrenes 2 per drupe or sometimes 1 apparently by abortion or incomplete pollination, spherical or hemispherical to wedge-shaped, ± smooth to finely fissured, rugose, and/or deeply fissured, endosperm entire to invaginated or ruminated.

Distribution. Sixty-nine species and one presumed hybrid in evergreen moist vegetation, usually in forest understory, at 0–2000 m in Africa (Senegal, Sierra Leone, Guinea, Benin, Mali, Liberia, Côte d'Ivoire, Burkina Faso, Ghana, Togo, Nigeria, Cameroon, Central African Republic, Democratic Republic of the Congo, Republic of the Congo, Equatorial Guinea, Gabon, Angola, Zambia), Madagascar, the Mascarene Islands (Mauritius, Réunion), Sri Lanka, and continental Southeast Asia (Thailand, Cambodia, Vietnam, Malaysia), Sumatra (Indonesia), and Borneo (Brunei, Malaysia, Indonesia).

REGIONAL KEYS TO *GAERTNERA* SPECIES

KEY TO *GAERTNERA* SPECIES IN AFRICA

- 1a. Inflorescence spiciform to narrowly pyramidal, unbranched or branched to 1 to 2 orders with axes short and congested; flowers sessile to subsessile; corolla red to orange-red outside; stipule lobes 5–15 mm long; Gabon, in coastal forests 63. *G. spicata*
- 1b. Inflorescence cymose to paniculiform, pyramidal, or corymbiform, with axes and/or pedicels developed, branched to 1 to 6 orders; flowers sessile to pedicellate; corolla white; stipule lobes 0–10 mm long; widespread in Africa.
 - 2a. Stipules with several to numerous setae 0.5–9 mm long at apex, in addition to the 4 stipule lobes.
 - 3a. Calyx limb lobed, lobes 0.8–4.5 mm long; stems pilosulose and/or hirtellous at least when young 8. *G. bieleri* p.p.
 - 3b. Calyx limb truncate to shortly lobed, lobes to 0.6 mm long; stems puberulent to glabrous.
 - 4a. Bark with longitudinal fissure or striations; stipules glabrous; inflorescence corymbiform, with branched portion 3–5.5 × 3–7 cm 21. *G. eketensis*
 - 4b. Bark apparently smooth; stipules pilosulose; inflorescence narrowly pyramidal, with branched portion 1.8–5 × 1.2–3 cm 38. *G. liberiensis*
 - 2b. Stipules without setae at apex, without lobes or with 2 or 4 developed lobes.
 - 5a. Stipules with ridges or wings not extending below the petioles, the stems merging smoothly into the petiole base or the base encircled by a thin, ciliolate, skirt-like flap.
 - 6a. Pedicels 1–9 mm long; inflorescences deflexed to pendulous, with axes mostly spreading at ca. 90 degrees 66. *G. trachystyla* p.p.
 - 6b. Pedicels 0–1 mm long; inflorescences ascending, with axes mostly ascending.
 - 7a. Corolla tube 4–6 mm long, lobes 2.5–5 mm long; stipules drying membranous . . . 40. *G. longivaginalis*
 - 7b. Corolla tube 2.5–4 mm long, lobes 1.5–2.5 mm long; stipules drying chartaceous . . . 50. *G. paniculata*
 - 5b. Stipules with wings or ribs extending below petiole as a thickened, well-developed wing or flange encircling petiole base.
 - 8a. Corolla tube 8–11 mm long, lobes 3.5–6 mm long, the lobes inflated and cucullate at apex, in bud the lobes forming an urceolate cap; leaves 9–25 × 3–10 cm, with the tertiary venation usually regularly sublineolate and evident abaxially 13. *G. cooperi*
 - 8b. Corolla tube 1.8–9 mm long, lobes 0.8–5 mm long (corolla size unknown in *G. letouzeyi*), the lobes flattened at apex or with an adaxial hook or flange, in bud the lobes forming a smoothly tapered, acute apex; leaves 2.2–33 × 0.8–13.5 cm, with the tertiary venation not evident abaxially or evident and irregularly to regularly areolate.
 - 9a. Leaves 16–33 × 7.5–13.5 cm, consistently large, with petioles rather thickened.
 - 10a. Calyx limb densely puberulent to pilosulose outside; inflorescences 4.5–10 × 4–8 cm 24. *G. gabonensis*
 - 10b. Calyx limb densely puberulent outside; inflorescences 7–23 × 6.5–22 cm . . . 36. *G. letouzeyi*
 - 9b. Leaves 2.2–23 × 0.8–8 cm, at least some of the leaves smaller than in the alternative lead, with petioles generally slender.
 - 11a. Calyx limb truncate or with lobes to 0.4 mm long.
 - 12a. Inflorescences, axes, and pedicels generally ascending; corolla tube 1.8–3.3 mm long, lobes 1.8–2.7 mm long; pedicels 0–2 mm long 5. *G. aurea*
 - 12b. Inflorescences deflexed to pendulous, axes and pedicels spreading to ca. 90 degrees; corolla tube 2.4–4.5 mm long, lobes 2.5–4 mm long; pedicels 1–9 mm long 66. *G. trachystyla* p.p.
 - 11b. Calyx limb lobed, lobes 0.8–4.5 mm long.
 - 13a. Stems pilosulose or hirtellous 8. *G. bieleri* p.p.
 - 13b. Stems glabrous 37. *G. leucothyrsa*

KEY TO *GAERTNERA* SPECIES IN ASIA (INCLUDING SRI LANKA)

- 1a. Leaves ternate, 0.1–0.3 cm wide; Sri Lanka 65. *G. ternifolia*
- 1b. Leaves opposite and/or ternate, 0.4–15 cm wide; widespread.

- 2a. Stipules, young stems, and/or undersides of leaves moderately to densely hirtellous, pilosulose, hispid, velutinous, and/or villous.
- 3a. Stipules with relatively narrow wings encircling base of petiole; peduncles 3–5.5 cm long; inflorescences with branched portion rather lax, corymbiform, 5–12.5 × 5–10 cm.
 - 4a. Stipule wings well developed below petioles and extending into ribs along the stipule tube; leaves 2.2–5 cm wide; Borneo 2. *G. alstonii*
 - 4b. Stipule wings restricted to area near petiole, the stipule tube generally smooth at least in upper portion; leaves 4–12 cm wide; Singapore and nearby islands 27. *G. grisea*
- 3b. Stipules with relatively broad wings encircling base of petiole; peduncles none or up to 2.5 cm long; inflorescences with branched portion congested-cymose to subcapitate, subglobose, 1.2–3 × 1.2–3 cm.
 - 5a. Flowers 4-merous; calyx limb truncate or with lobes up to 1 mm long; corolla tube 7.8–8.5 mm long; Borneo 11. *G. capitulata*
 - 5b. Flowers 5-merous; calyx limb lobed, lobes 0.5–4 mm long; corolla tube 4–5 mm long; continental Southeast Asia, Borneo 62. *G. schizocalyx*
- 2b. Stipules, young stems, and undersides of leaves glabrous to puberulent, or stems sparsely hirtellous to pilosulose becoming glabrescent.
 - 6a. Inflorescences pendulous on well-developed axillary or supra-axillary reproductive branches with usually reduced leaves.
 - 7a. Plants distylous; calyx 1–2 mm wide; fruits 14–17 mm long; Sri Lanka 17. *G. divaricata* p.p.
 - 7b. Plants dioecious; calyx 1.5–3.5 mm wide; fruits 7–8 mm long; continental Southeast Asia, Borneo 18. *G. diversifolia*
 - 6b. Inflorescences erect to pendulous on principal and/or axillary vegetative branches, or paired on leafless supra-axillary peduncles.
 - 8a. Stipules with tubular portion 20–75 mm long, drying chartaceous to leathery, funnellform (i.e., upper part spreading); leaves 20–55 × 7–19 cm, with well-developed cartilaginous margins . . . 47. *G. obesa*
 - 8b. Stipules with tubular portion 1–27 mm long, drying membranous to coriaceous, cylindrical (i.e., tubular, not spreading at apex); leaves 1–31 × 0.4–11 cm, with margins not to thinly cartilaginous.
 - 9a. Inflorescences regularly paired on axillary or supra-axillary peduncles.
 - 10a. Inflorescences lax, with axes dichasial at basal nodes then markedly scorpioid at more distal nodes; secondary leaf veins flat and hardly visible abaxially 17. *G. divaricata*
 - 10b. Inflorescences congested to subcapitate, with axes reduced or all dichasial; secondary leaf veins prominulous abaxially 48. *G. oblanceolata*
 - 9b. Inflorescences terminal on principal and/or axillary branches, or sometimes pseudoaxillary.
 - 11a. Inflorescences few-flowered (i.e., with 1 to 4 flowers), unbranched or branched to 1 order; leaves 1–9.4 × 0.4–4 cm; Sri Lanka.
 - 12a. Stipule lobes 1.5–5.5 mm long; flowers sessile or subsessile, with pedicels to 0.6 mm long; corolla tube 12–23 mm long 59. *G. rosea*
 - 12b. Stipule lobes 0.1–1 mm long; flowers sessile or with pedicels to 22 mm long; corolla tube 8–12 mm long.
 - 13a. Stipule tube 1.2–3 mm long, with narrow wings encircling petioles and extending onto tube; calyx lobes 0.8–2 mm long 25. *G. ×gardneri*
 - 13b. Stipule tubes 3–10 mm long, without wings around petioles or on tube; calyx lobes 0.3–0.5 mm long 70. *G. walkeri* p.p.
 - 11b. Inflorescences several- to many-flowered (i.e., with 5 to numerous flowers), subcapitate or branched to 1 to 6 orders; leaves 1.5–25 × 0.4–9 cm; widespread.
 - 14a. Inflorescences subcapitate to congested-cymose, in shape subglobose to corymbiform, sessile or with peduncle to 3.5 cm long, branched portion 0.5–3.5 × 0.5–3.5 cm; leaves oblanceolate to elliptic or lanceolate, usually narrowly so.
 - 15a. Plants drying with orange cast.
 - 16a. Calyx truncate or with lobes to 0.3 mm long; Asia 7. *G. belumutensis*
 - 16b. Calyx lobes 1–3.5 mm long; Asia 35. *G. kochummenii*
 - 15b. Plants drying green or with gray cast.
 - 17a. Stipule ribs narrowly winged; inflorescences 0.5–1.5 × 0.5–2 cm 64. *G. sralensis*
 - 17b. Stipule ribs broadly winged; inflorescences 1–3.5 × 1–3.5 cm.
 - 18a. Leaves 4.3–20 cm long; stipule lobes 7–10 mm long 11. *G. capitulata* p.p.
 - 18b. Leaves 15–25 cm long; stipules truncate or with lobes up to 0.3 mm long 26. *G. globigera*
 - 14b. Inflorescences rather to very laxly cymose, in shape corymbiform to pyramidal, sessile or usually at least some inflorescences with peduncles 0.9–7.5 cm long, branched portion 0.8–24 × 1.5–22 cm; leaves narrowly to broadly elliptic, lanceolate, ovate, obovate, elliptic-oblong, or oblanceolate.
 - 19a. Inflorescences with axes dichasial at lowest nodes then markedly scorpioid at more distal nodes; leaves with secondary veins flat and generally not evident abaxially; Sri Lanka 17. *G. divaricata* p.p.

- 19b. Inflorescences with axes regularly dichasial; leaves with secondary veins evident and usually raised abaxially; widespread.
- 20a. Flowers 4-merous; Peninsular Malaysia, Sarawak, Singapore.
 - 21a. Inflorescences pyramidal, deflexed to pendulous, with branched portion 3–11 × 3–9 cm; stipule lobes ca. 3 mm long 22. *G. fractiflexa*
 - 21b. Inflorescences rounded-corymbiform, erect, with branched portion 0.8–7 × 2.5–6 cm; stipule lobes 0.5–1.5 mm long . . . 69. *G. viminea*
- 20b. Flowers 5-merous; widespread.
 - 22a. Plants distylous, with flowers bisexual; Sri Lanka.
 - 23a. Corolla tubes 4–6 mm long; inflorescences many-flowered, with branched portion 2.5–24 × 1.1–17 cm; leaves 3–20 × 1.5–9 cm 67. *G. vaginans*
 - 23b. Corolla tubes 8.5–12 mm long; inflorescences several- to few-flowered, with branched portion 1.5–5 × 1.5–4.5 cm; leaves 1.5–9.4 × 0.4–4 cm . . . 70. *G. walkeri* p.p.
 - 22b. Plants dioecious, with flowers unisexual (often apparently homostylous in *G. aphanodioica*); continental Southeast Asia, Sumatra, Borneo.
 - 24a. Stipules drying membranous, with tube 7–15 mm long and lobes 1–2.5 mm long; leaves 3–14.5 × 0.8–5 cm; Peninsular Malaysia? 57. *G. ramosa*
 - 24b. Stipules drying chartaceous, with tube 3–25 mm long and lobes 1–7 mm long; leaves 3.5–24 × 0.7–9.5 cm.
 - 25a. Corolla white, with tube 6–8 mm long; stipule lobes 1–4 mm long; growing at 12–60 m above sea level in Borneo 3. *G. aphanodioica*
 - 25b. Corolla pale green to white, with tube 2.5–5 mm long; stipule lobes 1.5–7 mm long; growing at 0–1500 m, Thailand through Peninsular Malaysia and in Sumatra and Borneo 34. *G. junghuhniana*

KEY TO *GAERTNERA* SPECIES IN MADAGASCAR AND THE MASCARENE ISLANDS

- 1a. Stipules persistent as four spatulate to linear segments, these often overlapping due to shortened stem internodes; leaves 0.3–1.5 × 0.3–0.8 cm.
 - 2a. Leaves elliptic; calyx lobes 0.5–2.5 mm long; corolla tube 2.5–3 mm long 23. *G. furcellata*
 - 2b. Leaves cuneiform to spatulate or obovate; calyx lobes 2.4–3 mm long; corolla tube 4–4.5 mm long 45. *G. microphylla*
- 1b. Stipules caducous, deciduous often by fragmentation, or persistent, spathiform to tubular, calyptrate, funnellform, or splitting into 2 segments, overlapping or separated by well-developed stem internodes; leaves 0.3–51 × 0.3–14.5 cm.
 - 3a. Young stems, stipules, and leaves densely hirsute or hispid to pilose, hirtellous, pilosulose, velutinous, or tomentose with spreading, very evident pubescence.
 - 4a. At least the longest calyx lobes 3–14 mm long (do not confuse these with bracts).
 - 5a. Calyx lobes linear to narrowly triangular, pale green to green; secondary leaf veins 6 to 14 pairs; stipules with tube 11–30 mm long 53. *G. phanerophlebia* p.p.
 - 5b. Calyx lobes narrowly lanceolate to elliptic or ovate, white; secondary leaf veins 9 to 12 pairs; stipules with tube 8–21 mm long 54. *G. phyllosepala*
 - 4b. Calyx truncate or with lobes to 2.5 mm long.
 - 6a. Stipules with tube 22–68 mm long; corolla tube 10–13 mm long; plants drying with an orange cast 61. *G. schatzii*
 - 6b. Stipules with tube 7–40 mm long; corolla tube 3–11 mm long; plants not drying as above.
 - 7a. Corolla pale pink to purple; calyx lobes 0.5–2.5 mm long; pubescence drying gray-white 32. *G. ianthina*
 - 7b. Corolla white; calyx truncate or with lobes to 1.5 mm long; pubescence drying reddish brown to brown or gray.
 - 8a. Leaves 1.1–3.1 cm wide, with apex acute to shortly acuminate; corolla tube 6.5–11 mm long 30. *G. hispida*
 - 8b. Leaves 1.9–8.5 cm wide, with apex acute to rounded then sometimes abruptly very shortly cuspidate; corolla tube 3–6 mm long 49b. *G. obovata* var. *sphaerocarpa* p.p.
 - 3b. Young stems, stipules, and leaves glabrous or sparsely to densely puberulent, villosulous, strigillose, strigose, or sericeous with pubescence mostly appressed and not strongly evident.
 - 9a. Flowers solitary or 2 to 4 and fasciculate to shortly cymose; leaves 0.3–7 × 0.3–3.2 cm.
 - 10a. Stem internodes longitudinally ridged, ribbed, or winged; leaves 0.3–3.8 × 0.3–2 cm.
 - 11a. Flowers pedicellate, with pedicels 2.5–19 mm long; corolla tube 4–7.5 mm long.
 - 12a. Calyx lobes 0.4–4 mm long; stems 2-winged with corky bark 1. *G. alata*
 - 12b. Calyx truncate or with lobes to 0.4 mm long; stems with rounded ridges and appressed, non-corky bark 51. *G. pauciflora* p.p.

- 11b. Flowers sessile or subsessile, with pedicels to 1 mm long; corolla tube 2.5–5.5 mm long.
- 13a. Stipules caducous; calyx lobes 1.1–4.2 mm long 9. *G. brevipedicellata*
- 13b. Stipules persistent or splitting into several segments; calyx lobes 0.5–2.5 mm long. . .
. 23. *G. furcellata* p.p.
- 10b. Stems with internodes smooth; leaves $0.5\text{--}7 \times 0.3\text{--}3.2$ cm.
- 14a. Calyx limb truncate or with lobes to 0.4 mm long; stems glabrous.
- 15a. Stipules tubular, with 3 to 4 filiform lobes; inflorescences sessile or with peduncles 9–30 mm long 6. *G. bambusifolia*
- 15b. Stipules calyptrate, with 2 or 4 triangular to filiform lobes; inflorescences pedunculate, with peduncles 2.5–9.1 mm long 51. *G. pauciflora* p.p.
- 14b. Calyx with lobes 0.4–4 mm long; stems glabrous to pilosulose, villosulous, strigose, or sericeous.
- 16a. Stipules tubular; leaves 4–6.5 cm long; stems glabrous 16. *G. darcyana* p.p.
- 16b. Stipules calyptrate; leaves 0.5–4 cm long; stems pubescent 44. *G. madagascariensis*
- 9b. Flowers several to numerous, 5 or more, in heads or cymes; leaves $3\text{--}51 \times 1.4\text{--}14.6$ cm.
- 17a. Calyx lobes 1.5–15 mm long, at least some lobes 1.5 mm long or longer.
- 18a. Calyx lobes elliptic to narrowly elliptic or elliptic-oblong, markedly narrowed at base, 6–15 mm long; flowers mostly or all subtended by 2 white bracteoles 8–16 mm long . . . 55. *G. phyllostachya*
- 18b. Calyx lobes triangular to ligulate, spatulate, linear, elliptic-oblong, ovate, or lanceolate, broadest or a little narrowed at base, 1.5–8 mm long; bracteoles when present green to pale green and 8 mm long or shorter.
- 19a. Calyx funnelform to campanulate or tubular, 7–20 mm wide at mouth.
- 20a. Calyx lobes ligulate to linear, 6–8 mm long; leaves elliptic-oblong to obovate or cuneiform, $3\text{--}5.5 \times 1.4\text{--}4$ cm; flowers subsessile 15. *G. cuneifolia*
- 20b. Calyx lobes broadly triangular to ligulate, 1.5–5 mm long; leaves elliptic to oblanceolate, elliptic-oblong, or obovate, $8\text{--}17.5 \times 3.5\text{--}9$ cm; flowers pedicellate, with pedicels 5–18 mm long.
- 21a. Inflorescence axes and leaves glabrous 10. *G. calycina*
- 21b. Inflorescence axes and leaves pubescent
. *Gaertnera* sp. A of Verdcourt (see discussion under *G. calycina*)
- 19b. Calyx limb tubular to campanulate, 1–4.2 mm wide at mouth.
- 22a. Flowering stems and peduncles flexuous, with inflorescence pendulous; corollas white to pale blue 52. *G. pendula*
- 22b. Flowering stems and peduncles not flexuous, with inflorescences ascending; corollas white.
- 23a. Flowers 3 to 9 in lax fascicles or cymes $0.8\text{--}2 \times 0.4\text{--}2.5$ cm . . . 16. *G. darcyana* p.p.
- 23b. Flowers 10 or more in lax cymes to subcapitate heads $0.7\text{--}19 \times 1\text{--}20$ cm.
- 24a. Calyx lobes narrowly spatulate to elliptic-oblong, unequal on an individual flower, 5–7 mm long with at least some lobes more than 5 mm long 31. *G. humblotii*
- 24b. Calyx lobes broadly triangular or ovate to linear or narrowly spatulate, 1.5–5 mm long.
- 25a. Leaves broadly elliptic to obovate or ovate, drying thickly coriaceous, $1.5\text{--}12 \times 0.8\text{--}5.5$ cm; inflorescences subcapitate to congested 60. *G. rotundifolia* p.p.
- 25b. Leaves elliptic to elliptic-oblong, oblanceolate, or obovate, drying chartaceous to coriaceous, $2.5\text{--}24 \times 1\text{--}14.5$ cm; inflorescences subcapitate to laxly cymose.
- 26a. Stipules calyptrate, caducous or fragmenting quickly, with tube 11–55 mm long, drying membranous.
- 27a. Inflorescences subcapitate to congested-cymose, subsessile or with peduncle to 4.3 cm long, with branched portion 0.7–4.5 cm long 53. *G. phanerophlebia* p.p.
- 27b. Inflorescences laxly cymose to somewhat congested, pedunculate with peduncle 0.5–4 cm long, with branched portion 1.4–7.5 cm long 58. *G. raphaelii*
- 26b. Stipules tubular, usually regularly persistent at least on distalmost nodes or slowly deciduous by fragmentation, with tube 4–33 mm long, drying chartaceous.
- 28a. Stipules 10–33 mm long, cylindrical or usually inflated to funnelform . . . 43. *G. macrostipula* p.p.
- 28b. Stipules 4–12 mm long, cylindrical.
- 29a. Corolla tube ca. 13 mm long 29. *G. hirtiflora* p.p.
- 29b. Corolla tube 16–25 mm long 68. *G. vaginata*

- 17b. Calyx lobes all less than 1.5 mm long.
 - 30a. Stipules tubular, cylindrical to funnelform or inflated, persistent at least on distalmost several nodes, with tubes 10–80 mm long with at least some stipules 25 mm long or longer.
 - 31a. Inflorescences pendulous, with branched portion pyramidal 41. *G. lowryi*
 - 31b. Inflorescences generally ascending, with branched portion rounded-corymbiform.
 - 32a. Stipules entire (i.e., not cleft); corolla white or pink 43. *G. macrostipula*
 - 32b. Stipules deeply cleft into two segments; corolla white 46. *G. monstrosa*
 - 30b. Stipules calyptrate or tubular, cylindrical and rather closely enclosing the stem or caducous, with tubes 2–50 mm long, if 25 mm long or longer then calyptrate.
 - 33a. Plants generally slender; inflorescences ascending or deflexed to pendulous, subsessile or on stiff to flexuous peduncles or stems, sometimes with supra-axillary reproductive branches; corolla tubes 3–8 mm long.
 - 34a. Inflorescences subsessile to shortly pedunculate, peduncle to 2.7 cm long, without developed secondary axes or these 1 to 2 pairs and up to 1 cm long; flowers 5-merous 19. *G. drakeana*
 - 34b. Inflorescences pedunculate, peduncle 1.5–6 cm long, with 2 to 5 pairs of developed secondary axes, these 0.5–2 cm long; flowers 4-merous.
 - 35a. Stipules with tubes 4–10 mm long; leaves usually elliptic-oblong, to elliptic-lanceolate or obovate 12. *G. cardiocarpa*
 - 35b. Stipules with tubes 2.3–4.5 mm long; leaves narrowly elliptic to elliptic or oblanceolate 33. *G. inflexa*
 - 33b. Plants generally robust; inflorescences ascending on generally straight peduncles or vegetative stems; corolla tubes 3–32 mm long.
 - 36a. Stipules tubular and with 4 to 10 setae at apex in addition to 4 linear lobes.
 - 37a. Calyx truncate or with lobes to 0.6 mm long; stipules with tubular portion 2–5 mm long; corolla glabrous externally 20. *G. edentata* p.p.
 - 37b. Calyx lobed, with lobes 1–2.5 mm long; stipules with tubular portion 5–12 mm long; corolla densely puberulent to velutinous externally 29. *G. hirtiflora* p.p.
 - 36b. Stipules calyptrate or tubular, without setae, with lobes none or 1 to 4.
 - 38a. Stipules tubular, tubular portion 2–5 mm long. (This measurement arbitrary, species with overlap also listed in next couplet.)
 - 39a. Inflorescences with branched portion 2–6 cm wide, with 1 to 2 pairs of developed secondary axes; corolla tube 10–25 mm long 20. *G. edentata* p.p.
 - 39b. Inflorescences with branched portion 3–15 cm wide, with 2 to 5 pairs of developed secondary axes; corolla tube 10–14 mm long 56. *G. psychotrioides* p.p.
 - 38b. Stipules tubular or calyptrate, with tubular portion more than 5 mm long.
 - 40a. Inflorescences subcapitate to congested-cymose, without developed secondary axes or with 1 pair shortly developed and unbranched 60. *G. rotundifolia* p.p.
 - 40b. Inflorescences branched with 2 or more pairs of developed, branched secondary axes.
 - 41a. Stipules tubular and regularly persistent or sometimes fragmenting when old.
 - 42a. Stipules with tubular portion 8–17 mm long; fruit subglobose, 8–11 × 7.5–9 mm 4. *G. arenaria* p.p.
 - 42b. Stipules with tubular portion 2–12 mm long; fruit ellipsoid, 7–10 × 6–8 mm 56. *G. psychotrioides* p.p.
 - 41b. Stipules tubular or calyptrate, caducous or quickly fragmenting.
 - 43a. Corolla with tube 17–32 mm long and lobes 8–12 mm long.
 - 44a. Corolla tube 7–9 mm diam. 14. *G. crassiflora*
 - 44b. Corolla tube 3–4 mm diam. 39. *G. longifolia*
 - 43b. Corolla with tube 3–16 mm long and lobes 2–5.5 mm long.
 - 45a. Corolla with tube 10–16 mm long and lobes 3.5–5.5 mm long 4. *G. arenaria* p.p.
 - 45b. Corolla with tube 3–10 mm long and lobes 2–4 mm long, if corolla tube 10 mm long then lobes 2–3 mm long.
 - 46a. Leaves with base rounded to truncate and secondary veins 8 to 10 pairs; corolla tube 6.5–10 mm long 42. *G. macrobotrys*
 - 46b. Leaves with base acute to obtuse and secondary veins 5 to 16 pairs; corolla tube 3–9 mm long.
 - 47a. Stipules with tubular portion 11–49 mm long; corolla white; in littoral forests on white sand substrates 28. *G. guillotii*
 - 47b. Stipules with tubular portion 8–32 mm long; corolla white to pink or lilac; in various habitats on various substrates 49. *G. obovata* p.p.

1. **Gaertnera alata** Bremek. ex Malcomber & A. P. Davis, Monogr. Syst. Bot. Missouri Bot. Gard. 104: 379, fig. 2. 2005. TYPE: Madagascar. Toamasina: Forêt d'Andisibe, bassin de l'Onive, 19°50'S, 47°51'E, Feb. 1925, *H. Perrier de la Bâthie* 17098 (holotype, P!).

Shrubs 1–2 m tall; *branchlets* terete, 0.5–2 mm diam., glabrous, usually $\pm$ 2-winged, $\pm$ corky, pale beige to gray or whitish; internodes 0.3–2.7 cm, with 2 or 3 longitudinal ribs. *Leaf* blades 0.6–3.6 $\times$ 0.3–1.8 cm, elliptic to elliptic-oblong or $\pm$ elliptic-obovate, apex acute to shortly abruptly acuminate, base cuneate to rounded, drying chartaceous, glabrous; secondary veins prominulous abaxially, 3 to 5(to 8) pairs; domatia present; petioles 0.9–3 cm. *Stipules* calyptrate, drying membranous, puberulent, caducous or persisting on a few nodes, tube 2–6.6 mm, with ribs 6, narrowly winged, 4 arising below petioles, 1 additional rib on each interpetiolar side, all these extending to apex, apex with 2 clefts, marcescent, lobes 2, 0.7–1.2 mm, deltate. *Inflorescences* terminal on principal and/or axillary branches, 1-flowered or 2- to 3(4)-flowered and subfasciculate, sessile, glabrous or puberulent, ebracteolate; pedicels 2.5–19 mm. *Flowers* 4-merous, presumably heterodistylous. *Long-styled flowers*: unknown. *Short-styled flowers*: calyx cup-shaped to $\pm$ urceolate, 1.5–2.6 mm wide, glabrous except inside with sparse hair-ring, lobes 0.4–4 mm, triangular to narrowly triangular or linear; corolla pale pink to pink, clavate in bud, at anthesis salverform, outside glabrous, tube 5–6 mm, 1.8–2.2 mm diam., glabrous inside, lobes 2.6–6.1 mm, triangular to narrowly triangular, acute; anthers included, filaments inserted just below middle of corolla tube, ca. 0.5 mm; style 2.7–5.4 mm, glabrous, stigma ca. 0.8 mm. *Drupe*s unknown.

Distribution and habitat. This species grows in Madagascar, in the provinces of Antananarivo and Toamasina, where it is known from humid evergreen escarpment forest south of Tsinjoarivo and southeast of Ambatolampy, at elevations of 1400–1550 m. Here, it grows on rocks in zones of metamorphic and igneous basement rock.

Phenology. This species has been collected with flowers in the months of January and February.

Discussion. *Gaertnera alata* can be recognized by its combination of few-flowered or solitary-flowered inflorescences, 2-winged rather corky branchlets, pubescent leaf domatia, calyptrate 6-ribbed stipules, relatively long pedicels, and relatively large pink flowers. The measurement for the corolla width given in the protologue, 4.2–12 mm wide, is the width across the corolla lobes at anthesis. This species is

similar in general aspect to some plants of *G. microphylla*, and perhaps closely related to that species. This species is so far known from few collections, and Malcomber and Davis (2005) provisionally considered the conservation status of this species to be Endangered (IUCN, 2001) based primarily on its limited known range. The type was attributed to Antananarivo Province by Malcomber and Davis (2005), but this locality is actually in Toamasina Province as cited here.

Additional specimens examined. MADAGASCAR. **Antananarivo**: 16.2 km SE de Tsinjoarivo, le long de la rivière d'Andrindimbola, *Messmer & Andriatsiferana* NM 690 (G, K), NM 692 (G, K).

2. **Gaertnera alstonii** Malcomber, sp. nov. TYPE: Malaysia. Sabah: Tongod, Kinabatangan, Melian Basin, Gunong Lotung, 830 m, 30 Mar. 1982, *G. Amin* SAN 95125 (holotype, SAN!; isotypes, K!, L!, SAR!).

Haec species *Gaertnerae junghuhnianae* Miq. similis, sed ab ea foliis oblongis atque stipulis pubescentibus in quoque latere tubi ac sub petiolo alis duabus longitudinalibus prominentibus munitis distinguitur.

Trees, 6–12 m tall; *branches* terete to quadrangular, when young pilosulose with indumentum drying yellow, becoming glabrescent, 2–5 mm diam.; internodes 3.2–5 cm, smooth. *Leaf* blades 6–15 $\times$ 2.2–5 cm, elliptic-oblong or oblanceolate to elliptic, apex shortly cuspidate or acuminate, base cuneate to obtuse, drying chartaceous, adaxially glabrous, abaxially glabrous except pilosulose on principal veins with indumentum drying yellow to brown; secondary veins visible abaxially, 8 to 12 pairs; domatia usually present; petioles 3–10 mm. *Stipules* tubular, pilosulose, drying membranous, deciduous through fragmentation, tube ca. 20 mm, with ribs 4, narrowly winged, arising and well developed below petiole, apex entire or usually with 2 incisions, marcescent, lobes 4, 3–11 mm, deltate to linear. *Inflorescences* terminal on principal and/or axillary branches, cymose, many-flowered, pilosulose; peduncle 3–5 cm; branched portion corymbiform, 5–11 $\times$ 5–17 cm, branched to 4 to 5 orders, lax; bracts 1–6 mm; bracteoles reduced; pedicels 1–3.5 mm. *Flowers* 5-merous, biology unknown, sessile to pedicellate. *Calyx* cup-shaped, 2–3 mm wide, outside pilosulose, inside glabrous, truncate or with lobes to 0.4 mm long, triangular; corolla, anthers, and stigmas unknown. *Drupe*s violet-black, subglobose or didymous, 5–7 $\times$ 5–6 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. *Gaertnera alstonii* grows in Southeast Asia, where it is known from Borneo,

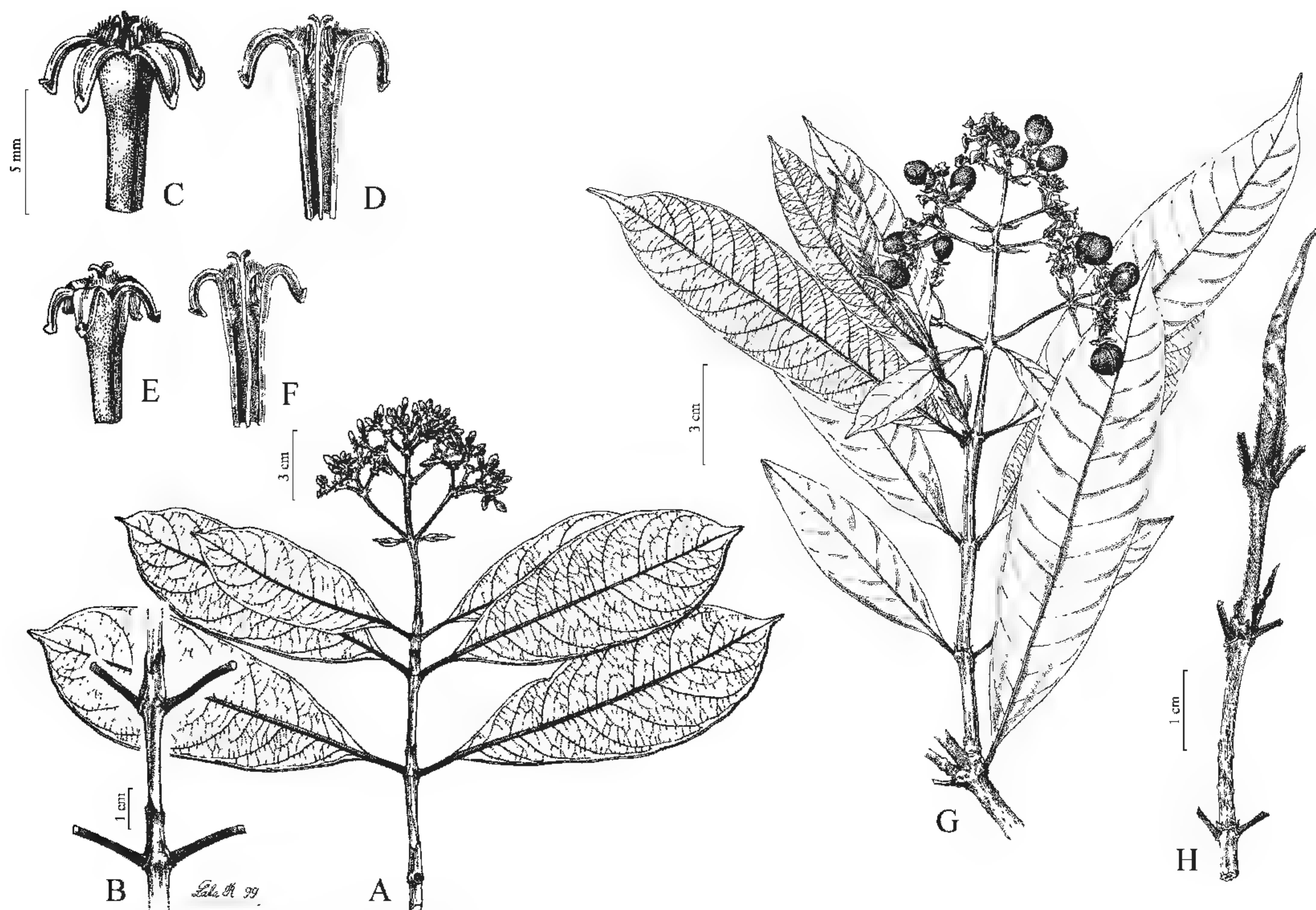


Figure 5. A–F. *Gaertnera aphanodioica* Malcomber. —A. Flowering branch. —B. Portion of stem with petiole bases and stipules. —C. Pistillate flower. —D. Pistillate flower in cross section. —E. Staminate flower. —F. Staminate flower in cross section. G, H. *Gaertnera ianthina* Malcomber. —G. Fruiting branch. —H. Portion of stem with petiole bases, stipules, and stem apex. C–F to same 5-mm scale. A–F based on Malcomber 2995; G, H based on Malcomber 2773.

specifically in its Kalimantan (Indonesia) and Sabah (Malaysia) sections. Here, it has been found in wet forests, at elevations of 50–2750 m.

Phenology. This species has been collected in fruit in January and March through December.

Discussion. This is a poorly known species represented only by fruiting collections, but it is easily recognized by its often elliptic-oblong leaves, dense short pubescence, and prominent longitudinal wings on the stipule tube that extend downward and encircle the petiole. *Gaertnera alstonii* is named in honor of Arthur Hugh Garfit Alston (1902–1958) who made the first collections of this species. This species belongs to the *G. vaginans* complex; see also the discussion of that group for related species and their distinctions.

Paratypes. INDONESIA. **Kalimantan:** Kwala Kwajan, Permantang, Alston 13252 (A, L). MALAYSIA. **Sabah:** Kalabakan Forest Reserve, Sumbing SAN 101357 (SAN); Tawau, Luasong Camp, Madani SAN 107944 (K, KEP, L, SAN).

3. *Gaertnera aphanodioica* Malcomber, sp. nov.
Gaertnera vaginans subsp. *junghuhniana* f.

hermaphrodita Beusekom, Blumea 15(2): 390, fig. 4E. 1967. TYPE: Brunei Darussalam. Belait: Seria, 18 Apr. 1957, S. Smythies, G. Wood & P. Ashton S 5909 (holotype, L!; isotypes, BRUN!, K!, KEP!, SING!). Figure 5A–F.

Haec species *Gaertnerae junghuhnianae* Miq. similis, sed ab ea tubo corollino 6–8 mm longo atque floribus ut videtur homostylis autem in effectu dioicis distinguitur.

Trees or shrubs, 2–12 m tall; *branches* terete or quadrangular, glabrous, 2–7 mm diam.; internodes 1.5–9 cm, smooth. *Leaf* blades 6–24 × 2–9 cm, elliptic to oblanceolate or ovate, apex shortly acuminate or acute, base cuneate, drying chartaceous, glabrous; secondary veins prominulous abaxially, 3 to 10 pairs; domatia usually present, hirtellous; petioles 5–35 mm. *Stipules* tubular, glabrous, drying chartaceous, caducous or deciduous through fragmentation, tube 10–25 mm, with ribs 4, narrowly winged, arising below petiole and sometimes extending to lobes, apex entire or usually with 2 incisions, marcescent, lobes 4, 1–4 mm, deltate. *Inflorescences* cymose, terminal on axillary branches, many-flowered, puberulent to pilosulose, sessile to pedunculate; peduncle to 6 cm; branched portion corymbiform, 4.5–11 × 4–18 cm,

branched to 3 to 5 orders, lax; bracts 6–20 mm; bracteoles reduced; pedicels to 1 mm. *Flowers* 5-merous, unisexual (but apparently homostylous), sessile to pedicellate. *Pistillate flowers*: calyx cup-shaped, 2–3 mm wide, outside glabrous or puberulent, inside glabrous, truncate or lobes to 0.3 mm, triangular; corolla white, clavate in bud, when open salverform, outside glabrous or puberulent, tube 6–9 mm, 2–4 mm diam., inside villous in upper third, lobes 2–4 mm, ligulate, ovate-oblong, or lanceolate, acute; staminodia included to partly exserted, filaments inserted in upper third of corolla tube, ca. 3 mm; style 7–8.5 mm, glabrous or often pubescent in upper part, stigmas 0.5–1 mm. *Staminate flowers*: similar to pistillate except corolla with tube 2.5–4.5 mm diam., lobes 3.5–4.5 mm; anthers included or shortly exserted, filaments ca. 2 mm; pistillode with style portion 7–8 mm, glabrous, stigmatic portion 1.5–2.5 mm. *Drupe*s violet-black, didymous or subglobose, 5–7 × 5–7 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Southeast Asia, where it is known from Borneo, specifically its Brunei and western Sabah (Malaysia) sections. It has been found in humid forests at elevations of 12–60 m.

Phenology. This species has been collected with flowers from April through August, and with fruits in August and September.

Discussion. *Gaertnera aphanodioica* as circumscribed here was previously treated by van Beusekom (1967) as a homostylous, bisexual form of *G. vaginans* subsp. *junghuhniana*. However, van Beusekom acknowledged that his form *hermaphroditica* Beusekom was heterogeneous and comprised several recognizable populations that he considered to have evolved in isolation. *Gaertnera aphanodioica* represents one of these populations from Brunei and western Sabah, which includes the type specimen of van Beusekom's form. Pollination studies in Berakas Forest Reserve in Brunei indicate that the plants are not bisexual as van Beusekom suggested, but functionally dioecious with the two flower forms almost indistinguishable (Malcomber, unpublished data). The epithet *aphanodioica* refers to the cryptic dioecy of the species. *Gaertnera aphanodioica* can often be found in the same vicinity as *G. junghuhniana* but differs in the flowers with stigmas or the stigmatic part of the pistillode and stamens or staminodia positioned at the same height within the corolla tube. This species belongs to the *G. vaginans* complex; see also the discussion of that group for related species and their distinctions.

Paratypes. BRUNEI DARUSSALAM. **Belait:** Andulau Forest Reserve, Compartment 5, *Malcomber* 2998 (MO), 2999 (MO), 3000 (MO). **Brunei-Muara:** Berakas Forest Reserve, *Hassan S2200* (K, SAR, SING), *Hassan S4928* (BRUN, SAR), *Malcomber* 2971 (MO), 2986 (MO), 2987 (MO), 2988 (MO), 2989 (MO), 2990 (MO), 2991 (MO), 2992 (MO), 2993 (MO), 2994 (MO), 2995 (MO), 2996 (MO), 2997 (MO); Universiti Brunei Darussalam campus, *Malcomber* 2966 (MO). MALAYSIA. **Sipitang:** Menggalong FR, *Meijer SAN 21809* (K, L, SAN).

4. *Gaertnera arenaria* Baker, J. Linn. Soc., Bot. 20: 209. 1883. *Sykesia arenaria* (Baker) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Madagascar. Tranomaro near Tamatave, July 1862, C. J. Meller s.n. (holotype, K!). Figure 6H–N.

Gaertnera spathacea Drake, in Grandid., Hist. Phys. Madagascar 36 (6, Atlas 6): t. 433. 1897 [1898]. *Gaertnera spathacea* Boivin ex Drake, Bull. Soc. Bot. France 45: 353. 1898 [1899], syn. nov. TYPE: Madagascar. Nosy-bé, *Boivin 2074* (holotype, P not located).

Trees or shrubs, 3–10 m tall; *branches* terete to subquadrangular, glabrous, 2–5 mm diam.; internodes 2–5 cm, smooth to shallowly sulcate. *Leaf* blades 5.5–19.5(–26) × 2–8(–11.5) cm, elliptic to oblong or obovate, apex shortly cuspidate, base cuneate or obtuse, drying chartaceous, glabrous; secondary veins prominulous abaxially, 6 to 9(to 11) pairs; domatia absent or present; petioles 2–11 mm. *Stipules* tubular, glabrous, drying chartaceous, persistent or occasionally deciduous after distalmost 1 to 3 nodes, tube 8–17 mm, with ribs 4, narrowly winged, arising below petiole and extending to lobes, apex entire or with 1 or 2 incisions, marcescent, lobes 4, 2.5–5 mm. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary stems, puberulent to glabrous, sessile or peduncle to 9 cm; branched portion corymbiform to broadly pyramidal, 3.5–18.5 × 5–16 cm, branched to 3 to 5 orders, lax; bracts 1–28(–65) mm; bracteoles triangular to ovate, 1–2 mm; pedicels to 5 mm long. *Flowers* 5-merous, heterodistylous, sessile to pedicellate. *Long-styled flowers*: calyx cup-shaped, 2.5–4 mm wide, outside puberulent at base to glabrous at apex, inside with hair-ring, truncate or lobes 0.2–0.5 mm, triangular; corolla white, rhomboidal in bud, at anthesis salverform, outside glabrous or scabrous, tube 10–16 mm, 1.8–4.5 mm diam., inside villous in upper third, lobes 3.5–5.3 mm, ligulate or oblong, acute; anthers included, filaments inserted in upper third of corolla tube, 1.2–1.5 mm; style 13–15 mm, glabrous, stigma 2–2.5 mm. *Short-styled flowers*: similar to long styled except calyx 2–3.5 mm wide, lobes 0.1–0.3 mm; corolla tube 10–15 mm, 1.5–4 mm diam., lobes 3.5–5.5 mm; anthers shortly exserted, filaments 2–3.5 mm; style 6–6.2 mm, stigma 1.7–1.9 mm. *Drupe*s violet-black, subglobose or globose to



Figure 6. A–G. *Gaertnera junghuhniana* Miq. —A. Flowering branch. —B. Portion of stem with petiole bases, bases of young leaves, stipule, and stem apex. —C. Portion of stem with petiole bases and stipule. —D. Staminate flower. —E. Staminate flower in cross section. —F. Pistillate flower. —G. Pistillate flower in cross section. H–N. *Gaertnera arenaria* Baker. —H. Flowering branch. —I. Fruiting branch. —J. Portion of stem with petiole bases and stipules. —K. Short-styled flower. —L. Short-styled flower in cross section. —M. Long-styled flower. —N. Long-styled flower in cross section. D, E to same 5-mm scale; F, G to same 5-mm scale; K, L to same 1-cm scale; M, N to same 5-mm scale. A–G based on *Malcomber 2028*; H–N based on *Moise 5*.

didymous, $8\text{--}11 \times 7.5\text{--}9$ mm; pyrenes spherical to ellipsoid or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is known from the provinces of Antsiranana, Fianarantsoa, Toamasina, and Toliara. Here, it is observed to be widespread in humid forests, at elevations of 0–1400 m, often near oceans.

Phenology. This species has been collected with flowers February through October, and with fruits January through March and September through December.

Discussion. *Gaertnera arenaria* is a member of the *G. vaginans* complex of species; see also the discussion of that group for related species and their distinctions. It is one of the most commonly collected species of *Gaertnera* in Madagascar. *Gaertnera arenaria* differs from other species in this group in its relatively long corolla tube, 10–16 mm long. *Gaertnera arenaria* is also similar to *G. macrobotrys* Baker; see the discussion under this latter species. The holotype collection of *G. spathacea*, *Boivin 2074*,

was not located, but based on its description and several other specimens annotated with this name by Drake, it appears to be synonymous with *G. arenaria*.

Representative specimens examined. MADAGASCAR. **Antsiranana:** Nosy-be, Lokobe, *Birkinshaw 117* (K, MO, TAN); Manongarivo Reserve, Ansatroto, *Gautier 2807* (G, MO); Bekolosy, *Malcomber 1946* (K, MO, P, TAN); near Ambalafary, *Malcomber 2229* (K, MO, P, TAN); Jardin Botanique, *Malcomber 930* (BR, G, MO, TAN, WAG); Montagne d'Ambre National Park, *Malcomber 1275* (MO, TAN), *1799* (K, MO, P, TAN); Marojejy Nature Reserve, *Schatz 1542* (BR, G, P, TAN, WAG); Sambava, Maroambihy, Anomadiobe, *Silasy RN 9512* (MO, TEF); Ambilobe, *Waterlot 335* (P). **Fianarantsoa:** Mananjary, *Geay 7370* (P). **Toamasina:** Foulpointe, *Decary 16982* (P); Masoala National Park, Andranobe, *Malcomber 2812* (MO), *2815* (MO); Maroantsetra, *Mocquers 197* (G-DC); Fenerive, Mahambo, *Peltier 2457* (P); Antetazana Forestry Station, *Razafimanantsoa RN 1563* (P). **Toliara:** Tolanaro near airport, *Gereau et al. 3236* (BR, MO, P, TAN, TEF, WAG); Andohahela Nature Reserve, *Malcomber 1152* (K, MO, P, TAN); Eminiminy, Itroky River, *Malcomber 2173* (MO, P, TAN); N of Isaka Ivondry, *Malcomber 2637* (K, MO, P, TAN); NW Manantenina, Ambalavoanio, *Cours 3203* (P, TAN).

5. *Gaertnera aurea* Malcomber, sp. nov. TYPE: Ivory Coast [Côte d'Ivoire]. Left bank of La Mé

River, near bridge to Mépé, 5°37'N, 3°39'W, 0–50 m, 1962, A. J. M. Leeuwenberg 4154 (holotype, WAG!; isotypes, BR!, K!, L!, MO!, P!).

Haec species *Gaertnerae cooperi* Hutch. & M. B. Moss similis, sed ab ea ramis gracilibus in juventute scabropubescentibus trichomatibus pallide fuscis atque tubo corollino brevior (1.8–3.3 mm longo) apice integro distinguitur.

Trees or shrubs, 2.5–4 m tall; *branches* flattened near apex, otherwise terete, young branches densely puberulent to short-pilosulose with indumentum drying yellow to brown, becoming glabrescent, 1.5–2.5(–6) mm diam.; internodes 0.8–5.5 cm, smooth. *Leaf* blades 6.5–19 × 3–6.5 cm, elliptic to elliptic-oblong or obovate, apex cuspidate to acuminate, base cuneate to obtuse, drying chartaceous, adaxially glabrous, abaxially glabrous or puberulent to pilosulose and sometimes hirtellous on costa and principal veins; secondary veins prominent abaxially, 4 to 7 pairs; domatia present; petioles 4–9 mm. *Stipules* calyptrate, glabrous to densely puberulent or pilosulose, drying chartaceous or membranous, caducous, often leaving a persistent base 1–3 mm, tube 10–54 mm, with ribs 4, low and rounded to narrowly winged, arising beneath petiole and sometimes extending to lobes, apex with a 1-interpetiolar incision, marcescent, lobes 4, 4–5 mm, deltate to linear. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches, densely puberulent to pilosulose; peduncle 1–5 cm; branched portion corymbiform, 1–7 × 1.5–9 cm, branched to 3 to 4 orders, congested to lax; bracts deltate or linear, 1–4 mm; bracteoles reduced; pedicels to 2 mm. *Flowers* 5-merous, heterodistylous, sessile to pedicellate. *Long-styled flowers*: calyx cup-shaped, 1.5–2.5 mm wide, glabrous outside, with hair-ring inside, truncate or lobes to 0.2 mm, triangular; corolla white, clavate in bud, when open salverform, outside puberulent to glabrous, tube 1.8–3.3 mm, 1.7–2.2 mm diam., inside villous in upper third, lobes 1.8–2.3 mm, ligulate or oblong, acute; anthers included, filaments inserted at ca. middle of corolla tube, 0.3–0.6 mm; style 2.8–3.4 mm, glabrous, stigmas 1.8–2.2 mm. *Short-styled flowers*: similar to long styled except calyx lobes up to 0.3 mm; corolla tube 2.3–3.2 mm, 1.7–2.2 mm diam., lobes 2–2.7 mm; anthers fully exerted, filaments inserted in upper third of corolla tube, 0.3–0.7 mm; style 0.8–1.2 mm, stigma 0.9–1.2 mm. *Drupes* violet-black, subglobose to ellipsoid, 5–10 × 5–8 mm; pyrenes ellipsoid or plano-convex to hemi-ellipsoid, rugose, deeply fissured, endosperm ruminated.

Distribution and habitat. This species grows in West Africa, where it is known from Ghana and Côte

d'Ivoire. Here, it has been found in wet forests at elevations of 0–100 m.

Phenology. This species has been collected with flowers throughout the year, and with fruits January through October.

Discussion. *Gaertnera aurea* has been confused with *G. cooperi* but is a more slender plant with a shorter, entire corolla tube, 2.3–3.2 mm long and not fenestrate versus 8–11 mm long and fenestrate in *G. cooperi*. *Gaertnera aurea* and *G. cooperi* share deeply fissured, ruminated pyrenes, an unusual condition. The specific epithet refers to the dense pale beige to brown drying color of the indumentum on the young branches.

Paratypes. GHANA. Bimpong FR, Foso, *Enti SP 599* (BR, MO); Tarkwa Distr., Benso, *Duah 5823* (BR, FHO); Kade Agricultural Station, *Enti SP258* (MO); Benso, Subiri Forest Reserve, *Enti SP346* (MO); Ankasa Forest Reserve, *Enti CG42670* (MO). IVORY COAST [CÔTE D'IVOIRE]. 25 km SW of Guéyo, *Leeuwenberg 3798* (BR, K, MO, P, WAG); 33 km along Abidjan–Adsope rd., *Leeuwenberg 7992* (K, MO, WAG); Abidjan University garden, *Aké Assi 673* (G, P); Abou-abou forest, betw. Abidjan & Grand Bassam, *Oldeman 240* (K, MO, P, WAG), *F. Hallé 409* (MO, P), *J. de Wilde 3161* (K, WAG), *Leeuwenberg 2366* (BR, FHO, K, L, WAG); betw. Grand Bassam & Azuretti, *C. Geerling 422* (BR, MO, WAG); IRHO, 20 km W of Grand Bassam, *W. de Wilde 348* (BR, K, P, WAG); Yapo forest, 40 km N of Abidjan, *Leeuwenberg 1814* (WAG), *Chatelain 538* (G); Anyama-Aouabo, 25 km N of Abidjan, *Versteegh & Widen Outer 50* (MO, WAG); Assinie, *R. Nozeran s.n.* (P); Abidjan, Banco Arboretum, *Aké Assi 654* (G), *Béjué 2971* (P), *Chatelain 2* (G), *F. Hallé 217* (P), 284 (P), 296 (MO, P), *J. de Wilde 135* (WAG), *F. Hallé 4* (MO); Banco National Park, *W. de Wilde 26* (BR, K, P, WAG), *Poilecot 3447* (G); Gnaou Forest, *Aké Assi 15881* (BR); Malamalesso, Le Bas Comoé, *Chevalier 17542* (P); Pays Adioukrou, Dabou, *Chevalier 17250* (P); Téké Forest, 12 km N of Anyama, *Beentje 568* (WAG); Toumanguié Forest, Aboisso–Grand Bassam rd., *Bamps 2041* (BR).

6. *Gaertnera bambusifolia* Malcomber & A. P. Davis, *Monogr. Syst. Bot. Missouri Bot. Gard.* 104: 380, fig. 2. 2005. TYPE: Madagascar. Antsiranana: Reserve Naturelle de Marojejy, along trail to the summit of Marojejy Est, NW of Mandena, wet, evergreen forest above second camp, 14°26'S, 49°15'E, 850–1000 m, 11 Feb. 1989, J. M. Miller & P. P. Lowry II 3978 (holotype, MO-5714849!; isotypes, K!, P!, TAN!).

Trees, to 3 m tall; *branches* terete to flattened, glabrous, 0.5–2 mm diam.; internodes 0.8–4 cm, smooth. *Leaf* blades 2.5–7 × 0.5–1.5 cm, linear-lanceolate to lanceolate, apex acuminate to long acuminate, base cuneate to obtuse, drying chartaceous, glabrous; secondary veins flat to thinly prominent abaxially, 4 to 6 pairs; domatia absent; petioles 1.3–4.5 mm. *Stipules* tubular, glabrous, drying membranous, caducous, tube 3–5.5 mm, with

ribs none or forming thin ridges under petioles, apex entire, marcescent, lobes 3 or 4, 0.3–2 mm, filiform. *Inflorescences* reduced to a single flower, terminal on principal and/or axillary branches, pendulous, sessile or pedunculate; peduncles 9–30 mm, glabrous; bracteoles reduced. *Flowers* 5-merous, biology unknown. *Calyx* cup-shaped, 1.9–2.5 mm wide, glabrous, truncate or lobes to 0.4 mm, triangular; corolla, anthers, and stigmas unknown. *Immature drupes* subglobose or didymous, $5.5\text{--}6 \times 5\text{--}6$ mm.

Distribution and habitat. This species grows in Madagascar, where it is known from the province of Antsiranana. Here, it has been found in humid evergreen forests of the Marojejy National Park and Anjanaharibe-Sud Wildlife Reserve, growing on metamorphic and igneous rocks at elevations of 850–1235 m.

Phenology. This species has been collected with immature fruits in February and March.

Discussion. *Gaertnera bambusifolia* is only known from two immature fruiting collections. The species is named for its distinctive lanceolate leaves and can also be recognized by its relatively short tubular stipules and its inflorescences reduced to a single, often long-pedicellate flower. Malcomber and Davis (2005) considered the conservation status of this species to be Endangered (IUCN, 2001) based primarily on its small known range.

Representative specimens examined. MADAGASCAR. **Antsiranana:** Andapa, Ambodiangezoka, Ambodisatrana, Anjanaharibe-Sud Special Reserve, *Ravelonarivo* 680 (K, MO, P, TAN).

7. *Gaertnera belumutensis* Malcomber, sp. nov.

TYPE: Malaysia. Johor: Kluang, Kluang Forest Reserve, Gunong Belumut, summit trail, $2^{\circ}03'N$, $103^{\circ}33'E$, 1000 m, 25 May 1998, S. T. Malcomber 3024 (holotype, MO!; isotypes, A!, AAU!, BO!, K!, KEP!, L!, QRS!, SAN!, SAR!, SING!).

Haec species *Gaertnerae acuminatae* Benth. similis, sed ab ea planta in sicco aurantiaca atque inflorescentia congesta capituliformi distinguitur.

Trees or shrubs, 1–6 m tall, drying with orange cast; branches terete, glabrous, 2–3 mm diam.; internodes 2.5–7 cm, smooth. Leaf blades $3.5\text{--}14 \times 1.2\text{--}3.5$ cm, elliptic or elliptic-lanceolate, apex shortly cuspidate or acuminate, base attenuate or cuneate, drying chartaceous, glabrous; secondary veins evident abaxially, 5 to 8 pairs; domatia absent or present; petioles 3–14 mm. Stipules tubular, glabrous, drying chartaceous, caducous or deciduous through fragmentation, tube 6–13 mm, with ribs 4, narrowly winged, arising below petiole and extending to lobes, apex

entire or with 2 opposite incisions, marcescent, lobes 4, 2–5 mm, deltate to linear. *Inflorescences* congested-cymose, terminal on axillary branches, several- to many-flowered, glabrous, subsessile or peduncle to 3.5 cm; branched portion subglobose or corymbiform, $1.1\text{--}3 \times 1.5\text{--}3$ cm, branched to 1 to 3 orders, congested; bracts deltate or trifid, 1–4 mm; bracteoles reduced; pedicels to 2 mm. *Flowers* 5-merous, floral biology unknown, sessile to pedicellate. *Calyx* cup-shaped, 3–5 mm wide, outside glabrous or puberulent, with hair-ring inside, truncate or lobes to 0.3 mm, triangular; corolla, anthers, and stigmas unknown. *Drupe*s violet-black, didymous or globose, $6\text{--}8 \times 7\text{--}8$ mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in southeastern Asia, where it is known from Peninsular Malaysia. Here it has been found in humid forests at elevations of 170–1000 m.

Phenology. This species has been collected with flowers February through May, and with fruits April through September.

Discussion. *Gaertnera belumutensis* is a poorly known species endemic to southern Johor State of Malaysia, with most of the collections from Gunung Belumut. In this region, only *G. belumutensis* and *G. kochummenii* are known to dry with a distinctive orange cast; *G. belumutensis* differs from the latter species in its glabrous stems, leaves, and stipules, and its generally truncate calyx. This species belongs to the *G. vaginans* complex; see also the discussion of that group for related species and their distinctions. The specific epithet refers to the type locality.

Paratypes. MALAYSIA. **Johor:** Endau, South Plateau, Kiew 2192 (KEP); Gunong Blumut [Gunung Belumut], Jumali 3004 (SING); Gunong Belumut, summit trail, E of Keluang, Malcomber 3023 (MO), Holtum 53 (L), Shah 2204 (A, L), Suppiah FRI 17830 (KEP, L, SING), Whitmore FRI 8726 (K, KEP, L), Suppiah FRI 17806 (KEP, SING), FRI 17844 (KEP), Walker F. S. KEP 33831 (KEP), Holtum 10687 (K); Gunong Pulai, Mat 3723 (SING); Kluang, Gunong Gua Riman, Jumali 3054 (SING); Labis Forest Reserve, Khairuddin FRI 32848 (KEP).

8. *Gaertnera bieleri* (De Wild.) E. M. A. Petit, Bull. Jard. Bot. État Bruxelles 29: 51. 1959. Basionym: *Psychotria bieleri* De Wild., Ann. Mus. Congo Belge, Bot., sér. 5, 2: 179, t. 64. 1907. TYPE: Belgian Congo [Democratic Republic of the Congo]. Distr. Forestier Central [Equateur-Orientale-Maniema], Haut Lopor, 1904, R. Bieler s.n. (holotype, BR!).

Grumilea fissistipula K. Schum. & K. Krause, Bot. Jahrb. Syst. 39: 563. 1907. *Gaertnera fissistipula* (K. Schum. &

K. Krause) E. M. A. Petit, Bull. Jard. Bot. État Bruxelles 29: 39. 1959. TYPE: Cameroon: bei Bipende im Umwald der Ngabilandschaft, Mar. 1900, *G. Zenker* 2252 ([holotype, B†]; lectotype, designated here, K!; isotypes, BM!, K! [labeled as 2252a]).

Trees or shrubs, 0.5–8 m tall; *branches* terete, when young pilosulose and/or hirtellous with indumentum drying brown or yellow, often becoming glabrescent, 1–4 mm diam.; internodes 0.8–5.5 cm, smooth. *Leaf* blades 2.2–17.5 × 1.1–7.8 cm, elliptic to oblong, oblanceolate, or obovate, apex cuspidate or acuminate, base acute to cuneate, drying chartaceous, adaxially glabrous or pilosulose on principal veins, abaxially glabrous or usually hirtellous to pilosulose or puberulent at least on principal veins with indumentum drying brown; secondary veins prominent abaxially, 3 to 10 pairs; domatia absent or present; petioles 2–11 mm. *Stipules* tubular, densely hirtellous to pilosulose, drying chartaceous, caducous, tube 2–12 mm, with ribs 4, narrowly winged, arising below petiole and extending to lobes, apex entire or sometimes with 2 opposite incisions, marcescent, lobes 4, 1–10 mm, deltate to filiform, setae none or numerous, to 2 mm. *Inflorescences* cymose, several- to many-flowered, terminal on principal and/or axillary branches, densely pilosulose to hirtellous, sessile or peduncle to 5.4 cm; branched portion subglobose, corymbiform, or narrowly pyramidal, 0.7–6.7 × 1.2–7.4 cm, rather congested, branched to 3 to 4 orders; bracts linear to filiform, 3–21 mm; bracteoles 1–2 mm; pedicels to 3 mm. *Flowers* 5-merous, heterodistylous, sessile to pedicellate. *Long-styled flowers*: calyx cup-shaped, 1–2 mm wide, outside glabrous to puberulent or pilosulose, with hair-ring inside, lobes (0.8–)2–4.5 mm, linear to narrowly triangular or lanceolate; corolla white, clavate in bud, when open infundibuliform or salverform, outside glabrous, tube 4–5 mm, 0.9–2.5 mm diam., inside villous in upper third, lobes 2–3 mm, ligulate or ovate-oblong to lanceolate, acute; anthers included, filaments inserted in upper third of corolla tube, 0.2–0.6 mm; style 4.5–7 mm, glabrous or pubescent, stigmas 0.3–1 mm. *Short-styled flowers*: similar to long styled except calyx lobes 0.9–3 mm; corolla tube 3–4.5 mm, 0.8–3 mm diam., lobes 1.4–3.5 mm; anthers fully exerted, filaments 2.2–3.6 mm; style 2–3.8 mm, glabrous, stigmas 1–1.4 mm. *Drupe*s violet-black, globose or subglobose, 5–12 × 5–12 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Central Africa, and also in West Africa east of the Dahomey Gap. It has been found in Cameroon, the Democratic Republic of the Congo, and Nigeria, in humid forests at elevations of 50–1270 m.

Phenology. This species has been collected with flowers throughout the year, and with fruits February through July.

Discussion. *Gaertnera bieleri* is a morphologically variable species, particularly in inflorescence shape, which may be subglobose, corymbiform, or pyramidal, although the inflorescence axes are usually relatively short and congested in all of these. This species is recognizable by its puberulent to hirtellous indumentum, well-developed linear-filiform calyx lobes, and stipule tubes with longitudinal ridges and four lobes plus sometimes numerous setae at the top. *Gaertnera bieleri* is similar to *G. longivaginalis* var. *bracteata* (E. M. A. Petit) Malcomber; see comments under that section of the paper as well.

The type of *Gaertnera fissistipula* was destroyed with the general Rubiaceae collection in the Berlin herbarium; the isotype specimen at K is selected here as lectotype because a digital image is available on the Aluka web site: <<http://www.aluka.org/page/content/plants.jsp>>.

Representative specimens examined. CAMEROON. 55 km SE of Eséka, S of Nyong River, 5 km W of Songhong, *Leeuwenberg* 5074 (K, MO, P, WAG); Bipinde, *Zenker* 4419 (BM, BR, K, L, P); Korup National Park, *Thomas* 4398 (K, MO, WAG), *D. Thomas* 6856 (MO). DEMOCRATIC REPUBLIC OF THE CONGO. 60 km N of Kisangani, Bengamiea, *Lisowski* 18904 (BR, K); Eala, *Lebrun* 331 (BR, FHO, G, P), *Pynaert* 1788 (BR); Kiou, Shabunda, Bulumba, *J. Léonard* 3743 (BR, FHO, G, K); Leopoldville, Inongo, betw. Selenge & Lukolela, *Goossens* 5017 (K). GABON. **Woleu Ntem**: 20 km E of Mitzié, *Jeffrey* 231 (K, P). NIGERIA. Stubbs Creek Forest Reserve, 30 km E of Eket, *Van Meer* 1185 (WAG).

9. *Gaertnera brevipedicellata* Malcomber & A. P. Davis, Monogr. Syst. Bot. Missouri Bot. Gard. 104: 382, fig. 3. 2005. TYPE: Madagascar. Fianarantsoa: Ranomafana National Park, Talatakely, 21°16'S, 47°25'E, 800–900 m, 5 Nov. 1997, S. Malcomber, A. Davis, D. Gower, J. Andriantiana & A. Katozafy 2877 (holotype, MO!; isotypes, BR!, G!, K!, P!, PRE!, TEF!, WAG!).

Shrubs, 2–6 m tall, sometimes clambering; *branches* terete, glabrous, 0.5–3 mm diam., with bark corky, pale gray; internodes 0.4–4.5 cm, with 2 longitudinal ribs or wings. *Leaf* blades 0.8–3.8 × 0.4–2 cm, elliptic or ovate to elliptic-oblong, apex shortly acuminate, base obtuse to acute, drying chartaceous, glabrous; secondary veins thinly prominent abaxially, 3 to 5 pairs; domatia absent; petioles 1.2–2.8 mm. *Stipules* calyptrate, glabrous, drying membranous, caducous, tube 1.6–7.5 mm, with ribs 4, narrowly winged, arising beneath petiole extending to lobes, additionally 1 rib on each side extending along middle of interpetiolar side, with wings under petioles

becoming indurated and somewhat enlarged with age, apex with 1 or 2 incisions, marcescent, lobes 4, 0.4–1 mm, linear. *Inflorescences* reduced to a single flower, terminal on axillary branches; bracteoles reduced. *Flowers* 5-merous, heterodistylous, subsessile. *Long-styled flowers*: calyx cup-shaped, 1.5–2 mm wide, glabrous, lobes 1.1–4.2 mm, narrowly triangular to linear; corolla pink, clavate in bud, when open salverform, outside glabrous, tube 3–3.5 mm, 1.4–2.5 mm diam., inside villous at ca. middle, lobes 3.5–4.8 mm, triangular or ligulate, acute; anthers included, filaments inserted at ca. middle of corolla tube, ca. 0.2 mm; style 4.5–5.5 mm, glabrous, stigma 1–1.2 mm. *Short-styled flowers*: similar to long styled except calyx lobes 1–4.5 mm; corolla tube 4–5.5 mm, 1–2.5 mm diam., lobes 4–5 mm; anthers shortly exerted, filaments 2.5–3.5 mm; style 1.5–2 mm, stigma 1.5–1.6 mm. *Drapes* violet-black, subglobose or didymous, 4.5–5.5 × 4.5–7 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it has been found in the province of Fianarantsoa in humid evergreen forests in the Ranomafana National Park. Here, it grows on metamorphic and igneous rocks at elevations of 800–1000 m.

Phenology. This species has been collected with flowers in November and once with fruits, but the month of that collection was not noted.

Discussion. *Gaertnera brevipedicellata* is similar to *G. madagascariensis* in the inflorescence reduced to a single flower, but differs from that species in lack of indumentum, internodes and stipules with prominent longitudinal ridges or wings, and pink subsessile flowers. The well-developed internode ridges or wings are distinctive; these do not extend onto the stipule sheath. Malcomber and Davis (2005) considered the conservation status of this species to be Endangered (IUCN, 2001) primarily due to its limited known range.

Representative specimens examined. MADAGASCAR. **Fianarantsoa:** Ranomafana National Park, Talatakely, *Kotozafy 1073* (MO, TEF), *Malcomber 2876* (MO, TEF); Ranomafana National Park, Vatoharanana, *Malcomber 2867* (MO, TEF).

10. *Gaertnera calycina* Bojer, Hortus Maurit. 217. 1837. *Sykesia calycina* (Bojer) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Mauritius. Grand Bassin and Chamarel, *W. Bojer s.n.* (holotype, P not located; isotypes, BM!, MAU!).

Gaertnera calycina var. *variegata* Bojer, Hortus Maurit. 217. 1837. TYPE: Mauritius. Trois Ilots, *Bojer s.n.* (holotype, P not located).

Gaertnera aetheonoma Steud., Nomencl. Bot. [Steudel], ed. 2, 1: 651. 1840, nom. nud. *Gaertnera vaginata* Sieber ex A. DC., Prodr. (DC.) 9: 35 (1845), nom. nud., pro syn. TYPE: Mauritius. s. loc., *Sieber s.n.* (holotype, P not located).

Gaertnera sieberi C. Presl, Abh. Königl. Böhm. Ges. Wiss. 5, Bd. 3: 507. 1845, nom. nud. TYPE: Mauritius. s. loc., *Sieber 55* (holotype, PR? not located).

Trees or shrubs, 0.9–1.2 m tall; *branches* terete to subquadrate, glabrous, 4–7 mm diam.; internodes 0.5–3.5 cm, smooth. *Leaf* blades 8–17.5 × 3.5–9 cm, elliptic to oblanceolate or elliptic-oblong, apex obtuse then shortly cuspidate or rounded, base acute or cuneate, drying chartaceous, glabrous; secondary veins prominent abaxially, 10 to 13 pairs; domatia absent or present; petioles 17–30(–40) mm. *Stipules* incompletely known, caducous or fragmenting leaving truncate basal portion 2–5 mm, glabrous, marcescent. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches, glabrous; peduncle 3–4 cm long; branched portion corymbiform, 5–12 × 7–24 cm, branched to 2 to 3 orders, lax; bracts ligulate to ovate, deltate, or trifid, 12–30 mm, glabrous; bracteoles 3–8 mm; pedicels 5–18 mm, sometimes articulated above middle. *Flowers* 5-merous, presumably heterodistylous. *Long-styled flowers*: calyx campanulate, 9–20 mm wide, glabrous, lobes 2–5 mm, broadly triangular to rounded; corolla apparently white, clavate in bud, when open salverform, outside glabrous, tube 15–20 mm, 3.5–4 mm diam., inside villous in upper third, lobes 10–14 mm, ligulate to oblong, acute; anthers included, filaments inserted in upper third of corolla tube, ca. 1.5 mm; style 20–25 mm, glabrous, stigma 2.5–3 mm. *Short-styled flowers*: unknown. *Drapes* black (Bojer, 1837) or violet-black, ellipsoid to fusiform, 15–20 × 5–8 mm; pyrenes plano-convex or ellipsoid, rugose, finely fissured, endosperm entire.

Distribution and habitat. *Gaertnera calycina* grows in Mauritius and perhaps also in Madagascar. The localities, habitat, and elevation have not been recorded.

Phenology. This species was collected with flowers in March and has been collected in fruit, but the months of those collections were not noted.

Discussion. This unusual, probably showy and certainly striking species is notable for its relatively large calyx and is incompletely known and probably extinct (Walter & Gillett, 1998). The report of its distribution in Madagascar is based on one collection that is probably labeled erroneously. The most recent collection of this species was made by Bouton in the early 20th century (exact date unknown).

A similar but apparently distinct taxon, "*Gaertnera* sp. A" of Verdcourt (1983, 1989), was collected on Mauritius by Edgerley (as *MAU 13414*) in 1969. These plants differ from *G. calycina* in the pubescent inflorescence axes, smaller calyx, and larger pubescent leaves. Verdcourt (1989) noted that this collection is intermediate morphologically between *G. calycina* and a pubescent-leaved form of *G. longifolia* and could represent a hybrid between these two species, or could be equivalent to *G. calycina* var. *variegata*. Numerous researchers including S.T.M. have revisited Bassin Blanc attempting to re-collect both *G. calycina* and "*G. sp. A*" without success. Rare or extinct *Gaertnera* species have recently been rediscovered in Mauritius (e.g., *G. longifolia* var. *pubescens*; Anonymous, 1997), even in areas now dominated by introduced species, so "*G. sp. A*" and *G. calycina* might be rediscovered with continued exploration.

One variety of *Gaertnera calycina* has been described, based on the calyx white rather than green. Because this species has not been seen recently, the status of this variety is difficult to evaluate, but some other *Gaertnera* species show similar within-population variation in calyx color (e.g., *G. phyllostachya*) that does not seem taxonomically informative; consequently, variety *variegata* is not recognized here.

In the protologue for *Gaertnera calycina*, Bojer suggested tentatively that the name *Chassalia divaricata* DC. might also apply to this species, but he did not clearly accept the synonymy; thus, his name is treated here as validly published. *Chassalia divaricata* was more recently treated as a synonym of *C. lanceolata* (Poir.) A. Chev. (Verdcourt, 1989). As discussed above, de Candolle (1845) placed *G. calycina* into its own group, section *Aetheonoma*, based on several characters including an irregular arrangement of the anthers, with three alternipetalous and the other two opposite the corolla lobes. This condition has not been confirmed (cf. Verdcourt, 1989; S.T.M., pers. obs.) and may be an artifact of the preparation of some specimens. Steudel's name *G. aetheonoma* was apparently based on a specimen of Sieber's that was previously identified as *G. vaginata*.

Representative specimens examined. MADAGASCAR. s. loc., L. A. Chapelier s.n. (P). MAURITIUS. Grand Bassin Nouvelle Decouverte, L. S. Bouton s.n. (K); s. loc., Sieber 52 (E, G, L, MO, P, W), 188 (E, L, P).

11. *Gaertnera capitulata* Malcomber, sp. nov.
TYPE: Malaysia. Sarawak: Sri Aman, Selepong Barangan, 15 Aug. 1991, Y. P. C. Runi S 59673 (holotype, SAN!; isotypes, K!, KEP!, L!, MO!).

Haec species *Gaertnerae junghuhnianae* Miq. similis, sed ab ea stipulis in quoque latere tubi ac sub petiolo alis duabus

longitudinalibus prominentibus munitis atque inflorescentia congesta capituliformi distinguitur.

Shrubs, up to 1.5 m tall; *branches* terete, when young hirtellous to puberulent with indumentum drying reddish yellow, white, or brown, becoming glabrescent, 1–4 mm diam.; internodes 2–6 cm, smooth. *Leaf* blades 4.3–20 × 1.3–5.8 cm, elliptic to oblanceolate, apex acute to acuminate, base acute to cuneate, drying chartaceous, adaxially glabrous, abaxially hirtellous to villous or tomentulose with indumentum drying brown or reddened; secondary veins prominent abaxially, 4 to 10 pairs; domatia absent; petioles 3–20 mm. *Stipules* tubular, hirtellous to villous, drying chartaceous, persistent on distalmost nodes or deciduous leaving a truncate persistent base 1–4 mm, tube 6.5–13 mm, with ribs 4, broadly winged, arising below petiole and extending to lobes, apex entire or with 2 incisions, marcescent, lobes 4, 7–10 mm, deltate to linear. *Inflorescences* congested-cymose to subcapitate, many-flowered, terminal on principal and/or axillary branches, puberulent to hirtellous or villous, sessile or peduncle to 1.4 cm; branched portion subglobose, 1.2–3 × 1.2–3 cm, branched to 1 to 2 orders; bracts deltate, 1–10 mm; bracteoles reduced; pedicels to 1.5 mm. *Flowers* 4-merous, unisexual, sessile to pedicellate. *Pistillate flowers*: unknown. *Staminate flowers*: calyx cup-shaped, 2.5–3 mm wide, outside pilosulose or tomentulose, glabrous inside, truncate or lobes to 1 mm, triangular; corolla white, clavate in bud, when open salverform, outside puberulent, tube 7.5–8.5 mm, 0.7–2.5 mm diam., inside villous in upper third, lobes 2.5–3.5 mm, ligulate, apex acute; anthers shortly exserted, filaments inserted in upper third of corolla tube, ca. 0.3 mm; pistillode reduced. *Drupe*s unknown.

Distribution and habitat. This species grows in Southeast Asia, where it is known from Borneo, in both its Sarawak (Malaysia) and Kalimantan (Indonesia) sections. Here, it has been found in humid forests at elevations of 45–700 m.

Phenology. This species has been collected with flowers April through November.

Discussion. *Gaertnera capitulata* differs from most other Southeast Asian *Gaertnera* species by its prominent longitudinal wings arising beneath the petioles and extending along the stipule tube, generally elliptic leaves, and congested, subglobose inflorescences. It is similar to *G. schizocalyx*; see additional comments under that species. Most collections are densely pubescent but *Lee S 45386* is puberulent. This species belongs to the *G. vaginans* complex; see also the discussion of that group for related species and

their distinctions. The specific epithet refers to the often subcapitate inflorescences.

Paratypes. INDONESIA. **Kalimantan:** Upper Katingan River, 50–100 km WNW of Tumbang Samba, *Mogea* 3457 (K, KEP, L). MALAYSIA. **Sarawak:** Belaga, Linau, Sungei Iban, *Lee* S 45386 (K, KEP, SAN, SAR); Bukit Mersing, *Sibat ak Luang* S 21999 (K, SAN, SING); Sri Aman Distr., Selepong Barangan, *Malcomber* 3037 (MO), *Rena George* S 58327 (K, L, SAR).

12. *Gaertnera cardiocarpa* Boivin ex Baill., *Adansonia* 12: 238. 1879. TYPE: Madagascar. Toamasina: Sainte Marie, Tanambo, Apr. 1851, *L.-H. Boivin s.n.* (holotype, P!; isotype, G!).

Trees, 3–6 m tall, or sometimes climbing; *branches* flattened to terete, glabrous, 0.5–2.5 mm diam.; internodes 1.2–6 cm, smooth. *Leaf* blades 4.5–8 (–13.5) × 1.4–4(–6) cm, elliptic-lanceolate, elliptic-oblong, or elliptic to obovate, apex cuspidate or acuminate, base acute to cuneate, drying coriaceous or chartaceous, glabrous; secondary veins prominent abaxially, (5 to) 7 to 11 pairs; domatia absent or present; petioles (2–) 4–11 mm. *Stipules* tubular, glabrous, drying chartaceous, caducous or rarely persistent on distalmost 1 or 2 nodes, tube 4–10 mm, with ribs 4, narrowly winged, arising below petiole and extending to lobes, apex entire or with 1 incision, marcescent, lobes 4, 0.3–1.5 mm, deltate to linear. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches, glabrous; peduncle 2.5–6 cm; branched portion narrowly pyramidal, 1.8–11.5 × 1.5–7 cm, pendulous, branched to 2 to 3 orders, lax; bracts deltate, 1.5–7 mm; bracteoles triangular to lanceolate, 0.5–1.5 mm; pedicels absent or to 3 mm. *Flowers* 4-merous, heterodistylous. *Long-styled flowers:* calyx cup-shaped, 1.5–3 mm wide, glabrous, truncate or lobes to 0.3 mm, triangular; corolla white, clavate in bud, when open salverform, outside glabrous, tube 5–6 mm, 1.3–2.5 mm diam., inside villous at ca. middle, lobes 3.5–5 mm, triangular to ligulate, acute; anthers included, filaments inserted at ca. middle of corolla tube, ca. 0.4 mm long; style 5.5–7 mm, glabrous, stigma 1.5–2 mm. *Short-styled flowers:* similar to long styled except calyx 1.8–3 mm wide, lobes to 0.2 mm; corolla tube 1.2–2.5 mm diam.; filaments 0.9–1.5 mm; style 1.3–2 long, stigmas 1–1.5 mm. *Drupe* violet-black, globose to subglobose or didymous, 5.5–6 × 7–7.5 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is known from the province of Toamasina. Here, it has been found in the Île Sainte Marie, Mananara-Nord National Park, and the

Masoala Peninsula, growing in humid forests at elevations of 0–300 m.

Phenology. This species has been collected with flowers May through November, and with fruits April through October.

Discussion. *Gaertnera cardiocarpa* can be recognized by its chartaceous to coriaceous leaves, narrowly pyramidal inflorescences, and 4-merous distylous flowers. It is generally similar to *G. inflexa*, but differs in its inflorescences usually borne terminally on axillary branches and its reduced stipule lobes. *Gaertnera cardiocarpa* often dries blue-gray when the collections are not preserved in alcohol prior to drying. A climbing habit is reported in the notes of *Dumetz* 914, but other specimens are reported as trees.

Representative specimens examined. MADAGASCAR. **Toamasina:** Mananara-Nord, Ivontaka-Sud, *Dumetz* 914 (MO); Masoala Peninsula, *Schatz* 2705 (MO, P, TAN), *Lowry et al.* 4471 (MO, P), *Lowry* 4486A (MO, P), 4127 (MO, P), *Malcomber* 2803 (MO, TEF), *Malcomber* 2820 (MO, TEF).

13. *Gaertnera cooperi* Hutch. & M. B. Moss, Fl. W. Trop. Afr. 2: 21. 1931. TYPE: Liberia. Dukwia River, *G. P. Cooper* 287 (holotype, K!; isotype, A!).

Trees or shrubs, 4–8 m tall; *branches* flattened to quadrangular or terete, when young puberulent to pilosulose with indumentum drying reddish to brown, becoming glabrescent to pilosulose with indumentum drying pale brown, 1.5–8 mm diam.; internodes 1.5–8 cm, smooth. *Leaf* blades 9–25 × 3–10 cm, elliptic to oblong or ovate, apex shortly cuspidate to acute, base cuneate to obtuse, drying coriaceous to stiffly chartaceous, adaxially glabrous, abaxially glabrous or puberulent on principal veins to throughout with indumentum drying reddish to brown; secondary veins prominent abaxially, 5 to 10 pairs; domatia absent; petioles 8–22 mm. *Stipules* calyptrate, densely puberulent to pilosulose, drying membranous, soon deciduous, tube 9–22.5 mm, with ribs 4, narrowly winged, encircling petiole base and extending to lobes, after falling leaving a persistent tubular base 1.5–2 mm high, apex with 1 or 2 incisions, marcescent, lobes 4, 0.5–3 mm, deltate. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches, densely puberulent to pilosulose or strigillose; peduncle 0.5–9 cm long; branched portion corymbiform, 2–8 × 1.5–16 cm, branched to 3 to 5 orders, rather congested; bracts deltate or linear to lanceolate, 1–9(–40) mm; bracteoles reduced; pedicels absent or to 2.8 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers:* calyx cup-shaped, 3.5–4.5 mm wide, glabrous to densely puberulent outside,

glabrous inside, lobes 0.3–4 mm, triangular to narrowly triangular; corolla white, clavate-urceolate in bud, when open salverform, outside glabrous to densely puberulent, tube 8–11 mm, 2–3 mm diam., fenestrate in upper part, inside villous in upper third, lobes 3.5–6 mm, spatulate to oblanceolate, apex inflated and cucullate; anthers shortly exserted, filaments inserted in upper third of corolla tube, 2–3.5 mm; style 12–15 mm, glabrous, stigma 1–1.5 mm. *Short-styled flowers*: similar to long styled except calyx 4.5–5 mm wide, lobes 0.1–0.5 mm; corolla 8–10.5 mm, 1.5–3 mm diam., lobes 3.5–6 mm; anthers well exserted, filaments 3–4 mm; style 2.5–3 mm, stigma 1.8–2.5 mm. *Drupe*s violet-black, globose to subglobose or didymous, 5–10 × 5–8 mm; pyrenes spherical to ellipsoid or hemispherical to hemi-ellipsoid, rugose, deeply fissured, endosperm ruminant.

Distribution and habitat. This species grows in West Africa, where it has been found in Ghana, Côte d'Ivoire, and Liberia. Here, it has been found growing in humid forests at elevations of 80–90 m.

Phenology. This species has been collected with flowers January, February, and May through December, and with fruits January through May and October through December.

Discussion. *Gaertnera cooperi* is similar to *G. aurea*, also of Ghana and Côte d'Ivoire; *G. cooperi* differs in its leaves drying coriaceous to stiffly chartaceous, its larger flowers with corolla tubes 8–11 mm long, and its corolla that is fenestrate in the upper part of the tube. This last character is unique in *Gaertnera*. On dried specimens of this species, the tertiary leaf venation is usually regularly sublineolate and well marked, in contrast to this venation being not evident or irregularly areolate in most *Gaertnera* species.

Gaertnera cooperi was first published with an English description and then was republished with a Latin description by the same authors in Kew Bull. 1937: 62, 1937, which is sometimes cited as its place of publication. However, a Latin description is not required by the *International Code of Botanical Nomenclature* (ICBN; McNeil et al., 2006) for valid publication of a name before 1 January 1935, so the first publication was adequate. As noted by Petit (1959a), the paratype specimens *Chevalier 12420*, *Chevalier 12664*, and *Chevalier 12936* do not belong to the same species as holotype; these specimens are included here in *G. longivaginalis* var. *bracteata*.

Representative specimens examined. GHANA. Ateiku, Vigne 1948 (K). IVORY COAST [CÔTE D'IVOIRE]. Tai National Park, beside Gala trail, *Gautier-Beguin 1032* (G),

Aké Assi 17797 (G, MO). LIBERIA. Grand Bassa Co., Barclayville, *Baldwin 11121* (K, MO); Bodji Town, *Adam 16307* (K, MO); Monrovia, 16 mi. N of University Forest, *Jansen 1650* (K, MO, WAG); near Firestone Plantations, Dukwai River, *Cooper 465* (BM, FHO, GH, K).

14. *Gaertnera crassiflora* Bojer, Hortus Maurit. 216. 1837. *Gaertnera crassifolia*, orth. var. *Sykesia crassiflora* (Bojer) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Mauritius. Trois Ilots et autour de Grand Bassin, *W. Bojer s.n.* (holotype, P not located; isotype, G-DC!).

Trees, height not noted; *branches* terete, glabrous, 3–5 mm diam.; internodes 1.5–2 cm, smooth. *Leaf* blades 12–19 × 5.8–7.5 cm, oblong to elliptic, apex rounded then abruptly contracted into a short tip, base cuneate, drying coriaceous, glabrous; secondary veins visible abaxially, ca. 7 pairs; domatia absent; petioles 10–15 mm. *Stipules* incompletely known, calyptrate, glabrous, caducous, tube length unknown, with ribs 4, narrowly winged, arising below petiole and extending to lobes, apex marcescent, lobes unknown. *Inflorescences* cymose, few-flowered, terminal on principal stems, glabrous; peduncle 1.5–2.5 cm; branched portion subglobose or corymbiform, 2.8–8.5 × 2–7 cm, branched to 1 to 2 orders, rather congested; bracts ligulate to ovate or trifid, 1–6 mm; bracteoles 1–5 mm. *Flowers* 5-merous, heterodistylous, subsessile. *Long-styled flowers*: calyx cup-shaped, 6–7 mm wide, outside glabrous, with hair-ring inside, truncate or lobes to 0.4 mm, triangular; corolla color unknown, clavate in bud, when open infundibuliform to salverform, glabrous outside, tube 28–32 mm, 7–9 mm diam., inside glabrous, lobes 10–12 mm, ligulate or elliptic-oblong, acute to obtuse; anthers included, filaments inserted in upper third of corolla tube, 0.2–0.3 mm; style 20–21 mm, glabrous, stigma 0.6–1.3 mm. *Short-styled flowers*: similar to long styled except corolla tube 17–19 mm, 3–5 mm diam.; anthers shortly exserted, filaments ca. 1.5 mm; style 15–16 mm, stigma 6.5–7 mm. *Drupe*s unknown, said to be ellipsoid to fusiform or pyramidal and white at maturity (Bojer, 1837).

Distribution and habitat. This species grows in Mauritius and has been reported also to grow in Madagascar, but this report seems doubtful, as discussed below. The habitat and elevational range have not been recorded.

Phenology. The collection dates for the specimens of this species have not been noted.

Discussion. This species is poorly known and probably extinct (Walter & Gillett, 1998). *Gaertnera crassiflora* can be recognized by its deciduous calyptrate stipules leaving persistent bases with

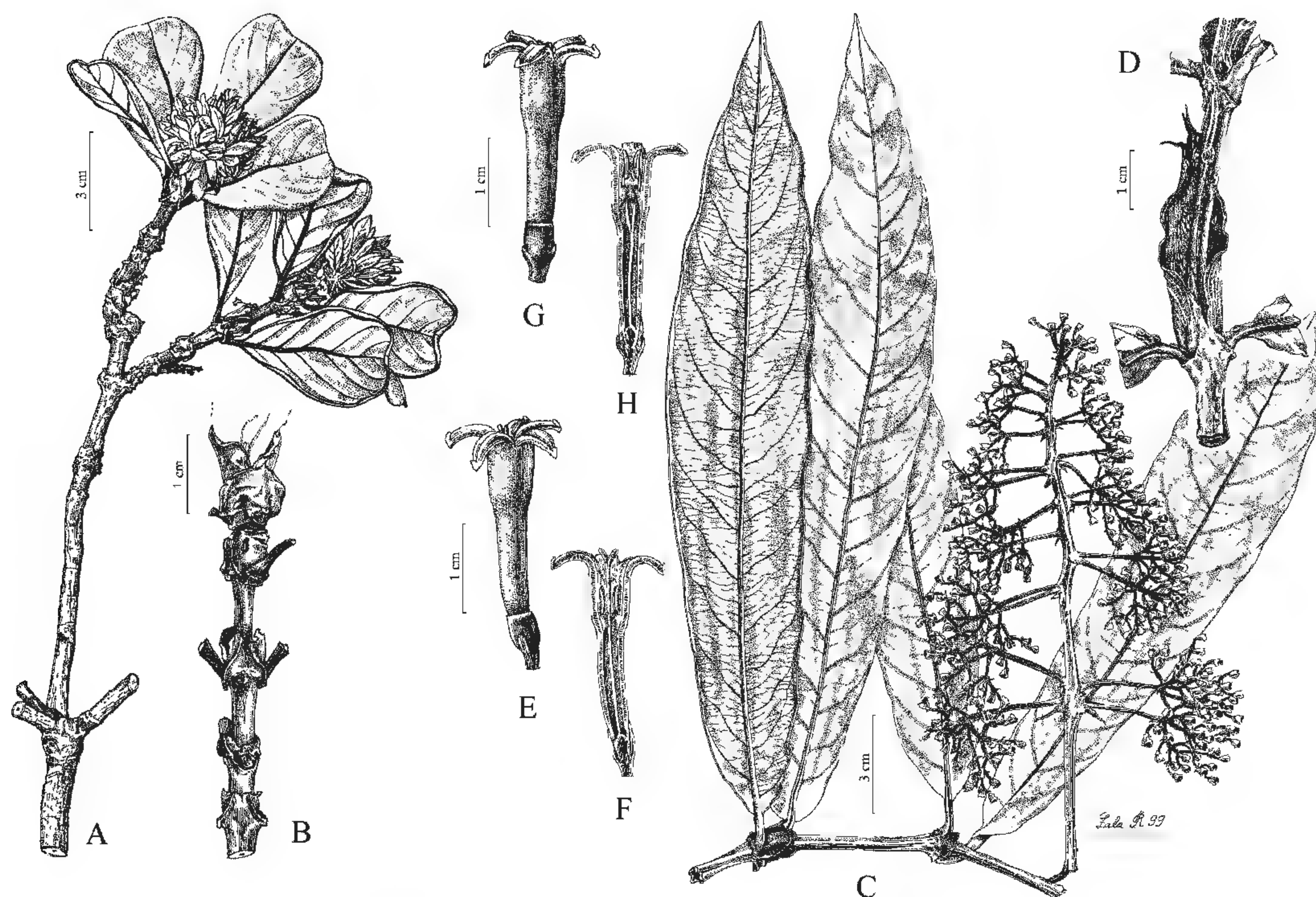


Figure 7. A, B. *Gaertnera cuneifolia* Bojer. —A. Flowering branch. —B. Portion of stem with petiole bases, stipules, and stem apex (young leaves not fully detailed). C–H. *Gaertnera lowryi* Malcomber. —C. Flowering branch (peduncle broken). —D. Portion of stem with leaf bases and stipules. —E. Long-styled flower. —F. Long-styled flower in cross section. —G. Short-styled flower. —H. Short-styled flower in cross section. E, F to same 1-cm scale; G, H to same 1-cm scale. A, B based on *Malcomber 2940*; C–H based on *Malcomber 2888*.

well-developed longitudinal wings and its subglobose to congested-corymbiform inflorescences. The collection locality of one specimen of this species, *Goudot s.n.* (G), is not from Mauritius and is given as near Tananarive (— Antananarivo), Madagascar. This species has not been found again in this region, and the distributional record seems most likely a labeling error.

Additional specimens examined. MADAGASCAR. **Antananarivo:** Near Tananarive [i.e., Antananarivo], *J. P. Goudot s.n.* (G). MAURITIUS. s. loc., *Bélanger 101* (P); received 1840, *J. P. Goudot s.n.* (G); received Nov. 1875, *Herb. Horne s.n.* (K); *Herb. Roxburgh s.n.* (BM).

15. *Gaertnera cuneifolia* Bojer, Hortus Maurit. 216. 1837. *Sykesia cuneifolia* (Bojer) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Mauritius. Forests of Flacq, at Nouvelle Decouverte and on the peak in the middle of the island, *W. Bojer s.n.* (holotype, P not located; isotype, G-DC!). Figure 7A, B.

Trees or shrubs, 1–2 m tall; branches terete to flattened, glabrous, 3–5 mm diam.; internodes 0.5–1 cm, smooth. Leaf blades 3–5.5 × 1.4–4 cm, elliptic-oblong or obovate to cuneiform, apex rounded

to truncate and sometimes abruptly shortly cuspidate, base acute to obtuse, margins often thinly revolute, drying stiffly coriaceous, glabrous; secondary veins prominulous abaxially, 5 to 7 pairs; domatia usually present; petioles 2–5 mm. *Stipules* calyptrate, glabrous or pilosulose at least in upper part, drying membranous, caducous or deciduous through fragmentation, tube 14–20 mm, with ribs 4, arising below petioles, not extending onto tube or uniting in basal part of interpetiolar side of tube, apex with 1 incision, marcescent, lobes 2 or 4, 2–2.5 mm, deltate to linear. *Inflorescences* subcapitate, many-flowered, terminal on principal and/or axillary branches, glabrous, subsessile, subglobose, 2–4 × 2–4 cm, densely congested; basalmost (i.e., outermost) bracts often foliaceous, sometimes aggregated into an involucre; remaining bracts linear, 6–18 mm; bracteoles triangular, 2–3 mm. *Flowers* 5-merous, heterodistylous, subsessile. *Long-styled flowers:* calyx campanulate, 7–8 mm wide, glabrous, lobes 6–8 mm, linear to ligulate; corolla white, clavate in bud, when open salverform, outside glabrous or pubescent, tube to ca. 6 mm, to ca. 4 mm diam., pubescence condition inside unknown, lobes 7–10 mm, linear or ligulate, acute. *Short-styled flowers:* similar to long styled except corolla lobes

linear to ovate-oblong. *Drupes* white (Bojer, 1837) or violet-black, ellipsoid, ca. 15×10 mm; pyrenes plano-convex or ellipsoid, smooth or rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Mauritius. Here, it is known from heathlike vegetation on lava flows ("groundwater laterite") at elevations of 550–650 m.

Phenology. This species has been collected with flowers May through August, and with fruits January through May and in December.

Discussion. Baker (1877) treated *Gaertnera cuneifolia* as a synonym of *G. rotundifolia*, but Verdcourt (1983, 1989) recognized these as distinct species. Both species are only known from the distinctive heathlike vegetation found on local lava flows, and, unlike most *Gaertnera*, species grow there exposed to full sun (D. Lorence, pers. comm.). *Gaertnera cuneifolia* differs from *G. rotundifolia* in its elliptic-oblong, obovate, or cuneiform leaves with the tertiary venation flattened and invisible adaxially, its inflorescences with well-developed, usually involucre bracts, and its calyx lobes 6–8 mm long. In contrast, *G. rotundifolia* has broadly elliptic to obovate or ovate leaves with the tertiary venation sometimes elevated and evident adaxially, reduced bracts, and calyx lobes 1–2 mm long. The basalmost inflorescence bracts do not appear to be fused on most specimens, but do overlap widely and largely enclose the inflorescences. Field studies indicate that the two species also differ in phenology: *G. cuneifolia* flowers May through August, whereas *G. rotundifolia* flowers November through January. *Gaertnera cuneifolia* was listed as rare by Walter and Gillett (1998) and is apparently restricted to Black River Gorges National Park near Le Pétrin and environs.

Bojer suggested tentatively in the protologue that this species may be the same as *Chassalia coffeoides* DC., but did not positively accept that synonymy. Thus, this name seems validly published; *C. coffeoides* is treated here as a synonym of *Gaertnera psychotrioides*.

Representative specimens examined. MAURITIUS. Black River Gorges National Park, Lorence M 278 (MO), Malcomber 2940 (MO), Vaughan MAU 11894 (K, MAU); Plaine Champagne, Tirvengadam 969 (K).

16. *Gaertnera darcyana* Malcomber & A. P. Davis, Monogr. Syst. Bot. Missouri Bot. Gard. 104: 384, fig. 2. 2005. TYPE: Madagascar. Toamasina: 11.9 km N of Andasibe, Mantadia National Park, $18^{\circ}49'S$, $48^{\circ}26'E$, 930 m, 21 Nov. 1997, S. T. Malcomber 2921 (holotype, MO-5714898!; isotypes, BR!, K!, P!, TEF!, WAG!).

Shrubs, to 5 m tall, sometimes clambering; branches terete to flattened, glabrous, 2–4 mm diam.; internodes 1.4–6.5 cm, smooth or with a longitudinal furrow. *Leaf* blades $4\text{--}6.5 \times 0.7\text{--}3.2$ cm, linear-lanceolate to elliptic or lanceolate-elliptic, apex cuspidate or acuminate, base cuneate to rounded, drying chartaceous, glabrous; secondary veins flat to prominent abaxially, 4 to 7 pairs; domatia absent; petioles 0.1–1.1 mm. *Stipules* tubular, glabrous, chartaceous, caducous or deciduous through fragmentation, tube 1.7–12 mm, with ribs 4, narrowly winged, arising beneath petiole and sometimes extending to apex, apex entire or with 1 or 2 incisions, marcescent, lobes 4, 1.4–2.2 mm, linear. *Inflorescences* cymose, 3- to 9-flowered, terminal on axillary branches, glabrous, sessile or peduncle 1.2–2.1 cm; branched portion when present corymbiform, $0.8\text{--}2 \times 0.4\text{--}2.5$ cm, branched to 1 to 2 orders, lax; bracts deltate to linear or trifid, 2.5–8.6 mm; bracteoles reduced; pedicels 2–6 mm. *Flowers* 5-merous, presumably heterodistylous. *Long-styled flowers*: not seen. *Short-styled flowers*: calyx cup-shaped, 2–3.2 mm wide, glabrous, lobes unequal, 0.4–3.1 mm, triangular to narrowly spatulate or linear; corolla white, in bud clavate, when open tubular-funnelform, outside glabrous; tube ca. 4 mm, ca. 1.5 mm diam., villous in upper part, lobes ca. 2.2 mm, triangular, acute; anthers exerted, filaments inserted in upper part of tube, ca. 1.5 mm; style ca. 2.5 mm, stigmas ca. 1.2 mm. *Drupes* violet-black, subglobose to didymous, $6.5\text{--}7.5 \times 5.2\text{--}8.2$ mm; pyrenes spherical to hemispherical, rugose, finely fissured, endosperm ruminant.

Distribution and habitat. This species grows in Madagascar, where it is known from the provinces of Toamasina and Fianarantsoa. It is so far known only as a rare species found in humid evergreen forests on metamorphic and igneous rocks, at elevations of 700–1400 m.

Phenology. This species has been collected with flowers in November and December and has been collected with fruits, but the months of those collections have not been recorded.

Discussion. *Gaertnera darcyana* differs from other *Gaertnera* species in its few-flowered inflorescences, calyptrate stipules, and rather well-developed, narrow calyx lobes. Malcomber and Davis (2005) considered the conservation status of this species to be Vulnerable (IUCN, 2001).

Representative specimens examined. MADAGASCAR. **Fianarantsoa:** Haute vallée de la Rienana, Bassin du Matitanana, Humbert 3566 (P). **Toamasina:** Ambodiniana, Cours 1926 (P).

17. *Gaertnera divaricata* (Thwaites) Thwaites, Enum. Pl. Zeyl. 425. 1864. Basionym: *Pristidia*

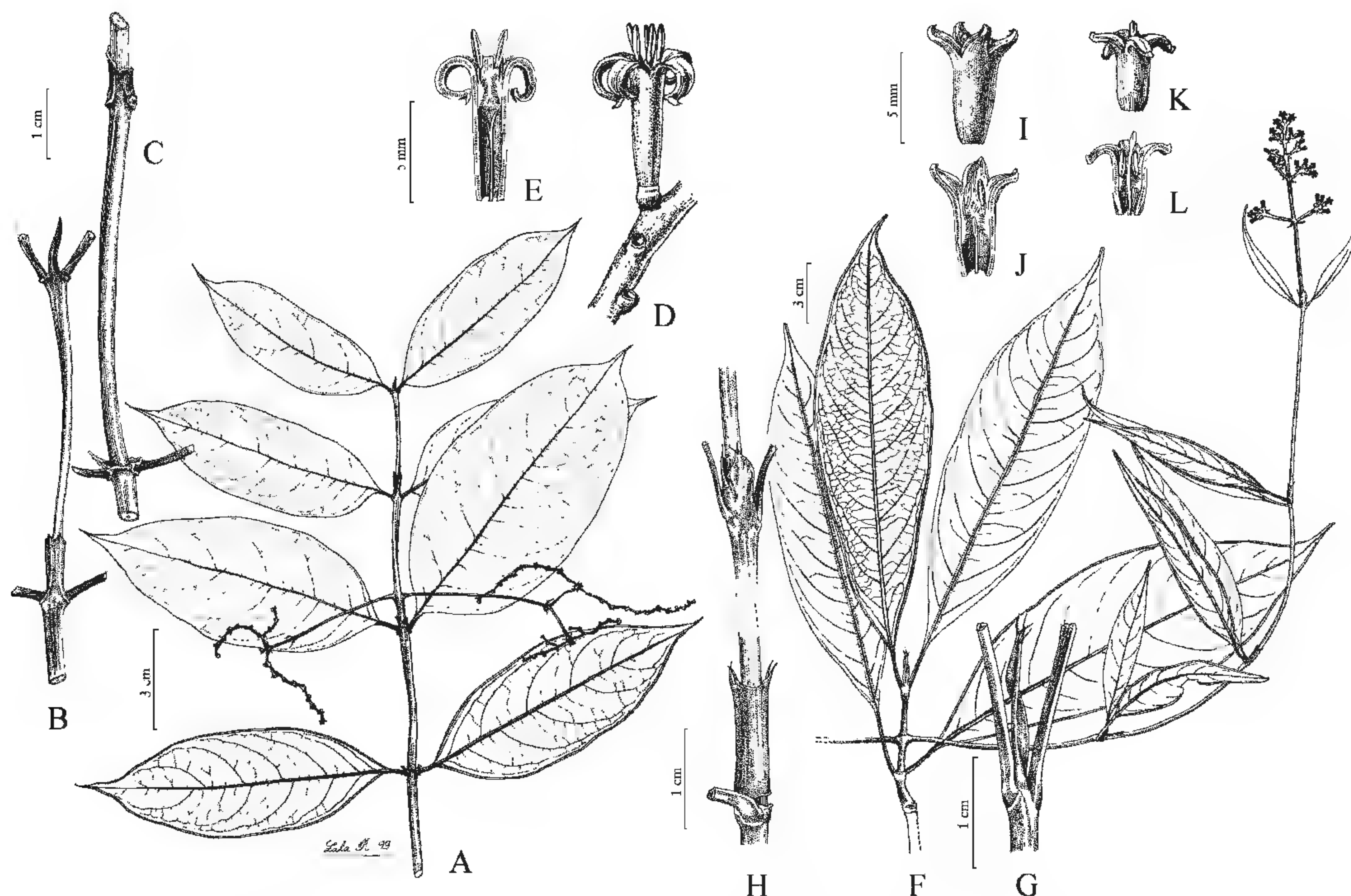


Figure 8. A–E. *Gaertnera divaricata* (Thwaites) Thwaites. —A. Young fruiting branch. —B. Portion of stem with petiole bases, stipules, and stem apex. —C. Portion of stem with petiole bases and old stipules. —D. Portion of inflorescence axis with short-styled flower. —E. Short-styled flower in cross section. F–L. *Gaertnera inflexa* Baill. —F. Flowering branch (to 3-cm scale). —G. Stem apex with petiole bases and stipules. —H. Portion of stem with petiole bases and stipules. —I. Short-styled flower. —J. Short-styled flower in cross section. —K. Long-styled flower. —L. Long-styled flower in cross section. B, C to same 1-cm scale; D, E to same 5-mm scale; I–L to same 5-mm scale. A–E based on *Malcomber 2762*; F–L based on *Malcomber 2900*.

divaricata Thwaites, Enum. Pl. Zeyl. 149. 1859.
Gaertnera koenigii var. *divaricata* (Thwaites) C.
B. Clarke, in Hook. f., Fl. Brit. India 4: 91. 1883.
TYPE: Sri Lanka. Near Galle, G. H. K. Thwaites
CP 2991 (holotype, K!; isotypes, BM!, BR!,
CGE!, G!, K!, P!, PDA!, W!, WU!). Figure 8A–E.

Trees, 1.5–3 m tall; branches flattened at apex, otherwise terete, glabrous, 1.5–3 mm diam.; internodes 3–10.5 cm, smooth. Leaf blades (4–)7.5–16 × (2–)2.8–8.5 cm, lanceolate to elliptic, elliptic-obovate, or obovate, apex acuminate to cuspidate, base cuneate or obtuse, drying chartaceous, glabrous; secondary veins flat and hardly or not visible abaxially, 4 to 6 pairs; domatia absent; petioles 3–12 mm. Stipules tubular, glabrous, drying chartaceous, caducous, tube (3–)6–9 mm, with ribs none or 4, narrowly winged, encircling base of petiole but not extending up tube, apex entire, marcescent, lobes 4, 0.5–1 mm, deltate. Inflorescences cymose, many-flowered, axillary or supra-axillary on principal branches, pendulous, glabrous; peduncle 3–7 cm; branched portion corymbiform to pyramidal, 1.3–9 × 2–9(–12) cm, lax, branched to 3 to 6 orders; axes

dichasial at basal nodes becoming scorpioid at distal nodes; bracts deltate to linear, 0.5–4 mm; bracteoles reduced; pedicels absent or to 1 mm. Flowers 4-merous, heterodistylous. Long-styled flowers: calyx cup-shaped, 1–2 mm wide, glabrous outside, with hair-ring inside, truncate to denticulate with teeth to 0.2 mm; corolla white, clavate in bud, when open salverform, outside glabrous, tube 4–5.1 mm, 1–2.5 mm diam., inside villous in upper third, lobes 2.5–4 mm, ligulate or triangular, acute; anthers shortly exserted, filaments inserted in upper third of corolla tube, ca. 0.5 mm; style 5–5.5 mm, glabrous, stigmas 0.5–1 mm. Short-styled flowers: similar to long styled except corolla tube 4.5–5.5 mm, 1–2 mm diam., lobes 2–3.5 mm; filaments 0.5–1.5 mm; style 2.5–3.5 mm, stigmas 1–1.5 mm. Drupes violet-black, subglobose or obovoid, 14–17 × 10–12 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Sri Lanka, where it is known from the district of Galle. Here, it has been found in humid forests at elevations of ca. 900 m.

Phenology. This species has been collected with flowers September through November, and with fruits January through August.

Discussion. *Gaertnera divaricata* is a distinctive species with axillary or supra-axillary inflorescences with scorpioid axes and 4-merous flowers. The species is locally common around Hiniduma, particularly in Kanneliya Forest Reserve.

Representative specimens examined. SRI LANKA. **Galle:** Halwitigala, *Waas 1316* (K, MO, PDA); Hiniduma, Kanneliya Forest Reserve, *Faden 76/503* (PDA), *Huber 582* (E, PDA), *Jayasuriya 1509* (K, MO, PDA), *Kostermans 27135* (G, L).

18. *Gaertnera diversifolia* Ridl., J. Fed. Malay States Mus. 6: 163. 1915. *Gaertnera oblanceolata* var. *diversifolia* (Ridl.) Beusekom, Blumea 15: 384. 1967. TYPE: Malaysia. Selangor: Bukit Etam, 1891, *H. J. Kelsall 1995* (lectotype, designated by van Beusekom, 1967 [1968]: 383, SING!). [SYNTYPE: Malaysia, *H. N. Ridley 7429* (SING!).]

Gaertnera intermedia Ridl., J. Fed. Malay States Mus. 6: 163. 1915. TYPE: Malaysia. Selangor: Hulu Semangko, Aug. 1904, *H. N. Ridley 12080* (holotype, SING!).

Gaertnera lanceolata Ridl., J. Fed. Malay States Mus. 6: 162. 1915, hom. illeg., non *Gaertnera lanceolata* Bouton ex A. DC., 1845. *Gaertnera oblanceolata* Ridl., J. Linn. Soc., Bot. 38: 317. 1908, hom. illeg., non *Gaertnera oblanceolata* King & Gamble, 1907. TYPE: Malaysia. Pahang: Gunong Tahan, June 1905, *L. Wray, Jr. and H. G. Robinson 5343* (lectotype, designated by van Beusekom, 1967 [1968]: 383, SING!). [SYNTYPE: Malaysia, *H. N. Ridley 16255* (syntype, SING!).]

Gaertnera ovata Ridl., J. Straits Branch Roy. Asiat. Soc. 86: 301. 1922. TYPE: Malaysia. Selangor: Semangkok Pass, *H. N. Ridley s.n.* (holotype, K!).

Gaertnera rigida Ridl., J. Straits Branch Roy. Asiat. Soc. 86: 301. 1922. TYPE: Malaysia. Negeri Sembilan: Bukit Tangga, *H. N. Ridley s.n.* (holotype, K!).

Gaertnera latifolia Ridl., J. Bot. 62: 299. 1924. TYPE: Malaysia. Selangor: Fraser's Hill, Sep. 1922, *I. Burkill & R. E. Holttum 8608* (holotype, SING!).

Trees or shrubs, 0.5–3 m tall; *branches* terete to quadrangular, glabrous, 1–6 mm diam.; internodes 3–5.5 cm, smooth. *Leaf* blades 10–30 × 2–11 cm, oblanceolate to obovate, apex shortly acuminate or acute, base acute to attenuate to cuneate, drying coriaceous, glabrous; secondary veins prominent abaxially, 5 to 15 pairs; domatia absent; petioles 12–40 mm. *Stipules* tubular, glabrous, variously persistent, caducous, or deciduous through fragmentation sometimes leaving a truncate base 1–8 mm, tube 8–18 mm, with ribs 4, narrowly to broadly winged, arising below petiole and extending along tube to lobes, apex with 2 incisions, marcescent, lobes 2 or 4, 1–4 mm, narrowly triangular to deltate. *Inflorescences* cymose, many-flowered, terminal on

axillary and/or supra-axillary branches, puberulent to pilosulose, pendulous; peduncle 1.3–5 cm; branched portion narrowly pyramidal, 2–7.5 × 4.6–6.5 cm, lax, branched to 3 or 4 orders; bracts and bracteoles reduced; pedicel 1–2 mm. *Supra-axillary* branches when present pendulous, up to 45 cm, 1–2 mm diam., with reduced leaves (0.2–)4–8(–15) × (0.1–)0.9–2 (–2.5) cm, linear to narrowly elliptic or oblanceolate, drying chartaceous; secondary veins prominulous abaxially, 4 to 8 pairs; petiole 1–10 mm. *Flowers* 5-merous, unisexual. *Pistillate flowers*: calyx cup-shaped, 1.5–3.5 mm wide, outside glabrous or puberulent, with hair-ring inside, truncate or lobes to 0.2 mm, broadly triangular; corolla white, in bud clavate, outside glabrous or puberulent, mature corolla, staminodes, and stigmas unknown. *Staminate flowers*: similar to pistillate as far as known, corolla villous inside in upper third. *Drupe*s violet-black, didymous or globose, 7–8 × 7–9 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Southeast Asia, where it is known in Peninsular Malaysia and Borneo; in Borneo it is known from the Brunei, Kalimantan (Malaysia), and Sarawak (Indonesia) sectors. Here, it has been found in humid forests at elevations of 130–1450 m.

Phenology. This species has been collected with flowers January through September, and with fruits January through May and July through December.

Discussion. *Gaertnera diversifolia* is a widespread, locally common species within Peninsular Malaysia and Borneo and is recognized by its narrowly pyramidal inflorescences often borne on pendulous supra-axillary branches and its 5-merous flowers. It is similar to *G. inflexa* of Madagascar, but differs from that by its 5-merous unisexual flowers. *Gaertnera diversifolia* was treated by van Beusekom (1967) as a variety of *G. oblanceolata*, but these are treated as two species here.

Representative specimens examined. BRUNEI DARUS-SALAM. **Belait:** Batu Patam, *Wong 1088* (A, BRUN, K, KEP, L, SAN). INDONESIA. **Kalimantan:** Bukit Raya, *Nooteboom 4324* (L). MALAYSIA. **Johor:** Buaya Sangkut, *Saw FRI 34247* (A, K, L, SAN, SING). **Negeri Sembilan:** Gunong Angsi, *Nur 11613* (L, SING). **Pahang:** Pine Tree Hill, *Malcomber 3018* (MO), *3019* (MO), *Ng FRI 1935* (K, KEP). **Sabah:** Ranau Distr., Tenompok Ridge, park headquarters, *Beaman 8215* (L). **Sarawak:** Miri, Suai, *Ilias S. 39183* (K, L, SAN, SAR). **Selangor:** Ulu Terengganu, *Ng FRI 22056* (KEP).

19. *Gaertnera drakeana* Aug. DC., Bull. Herb. Boissier, Sér. 2, 1: 586. 1901. TYPE: Madagascar. Toamasina: Maroa [Maroantsetra], in forest,

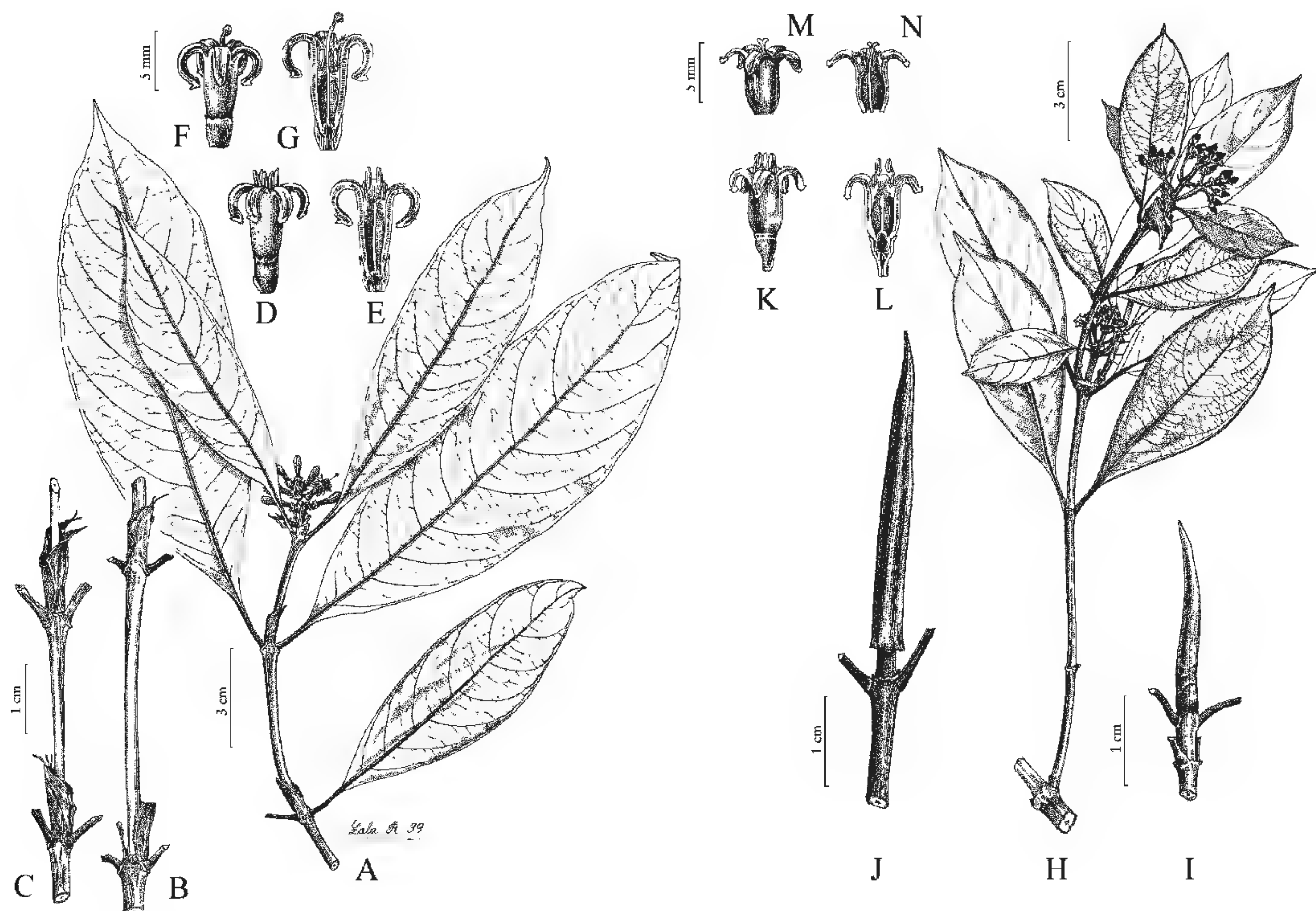


Figure 9. A–G. *Gaertnera drakeana* Aug. DC. —A. Flowering branch. —B, C. Portions of stems with petiole bases and stipules. —D. Short-styled flower. —E. Short-styled flower in cross section. —F. Long-styled flower. —G. Long-styled flower in cross section. H–N. *Gaertnera guillotii* Hochr. —H. Flowering branch (to 3-cm scale). —I, J. Portions of stems with petiole and apical stipules. —K. Short-styled flower. —L. Short-styled flower in cross section. —M. Long-styled flower. —N. Long-styled flower in cross section. B, C to same 1-cm scale; D–G to same 5-mm scale; K–N to same 5-mm scale. A–G based on *Moise* 2; H–N based on *Malcomber* 2913.

1897, *A. Mocquerys* 273 (holotype, G-DC!).
Figure 9A–G.

Trees, 0.3–6 m tall; *branches* flattened to terete, glabrous, 1.5–4 mm diam.; internodes (0.3–)2.8–7 (–11.3) cm, smooth. *Leaf* blades 5.5–16 × 1.5–4.8 cm, narrowly elliptic to oblanceolate, apex acuminate or cuspidate, base acute or cuneate, drying chartaceous, glabrous; secondary veins prominulous abaxially, 9 to 12 pairs; domatia absent; petioles 5–11 mm. *Stipules* tubular, glabrous, drying membranous, caducous or deciduous through fragmentation, tube 4.7–18 mm, with ribs 4, rounded to narrowly winged, arising below petiole and extending to lobes, apex with 1 or 2 shallow to deep incisions, marcescent, lobes 4, 2.1–5 mm, deltate or linear. *Inflorescences* subcapitate to cymose, several-flowered, terminal on principal and/or axillary branches, deflexed to pendulous, glabrous, sessile or peduncle to 2.7 cm; branched portion subglobose, 1.2–2.5 × 1.1–2.1 cm, branched to 2 to 3 orders, congested; bracts deltate, 0.5–1 mm; bracteoles ovate to triangular, 0.5–1 mm. *Flowers* 5-merous, heterodistylous, subsessile. *Long-styled flowers*: calyx cup-shaped, 2–

3.5 mm wide, glabrous, lobes 0.3–0.6 mm, triangular; corolla white, clavate in bud, when open salverform, outside glabrous, tube 6–7 mm, 1.5–4 mm diam., inside villous at ca. middle, lobes 4–7 mm, triangular or ligulate, acute; anthers included, filaments inserted in upper third of corolla tube, 0.2–0.5 mm; style 9–10 mm, glabrous, stigma 1–1.5 mm. *Short-styled flowers*: similar to long styled except calyx 2.2–3.5 mm wide, lobes 0.3–0.7 mm; corolla tube 6.5–8 mm, 2–4.5 mm diam., lobes 5.5–7 mm; anthers shortly exserted, filaments 3–4 mm; style 4–5 mm, stigma 1.5–1.8 mm. *Drupe*s violet-black or blue, globose to subglobose or didymous, 7–10 × 7–10 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it has been found in the province of Toamasina in the Mananara-Nord and Masoala National Parks. Here, it grows in humid forest at 0–300 m.

Phenology. This species has been collected with flowers August through December and has been collected in fruit, but the dates of those collections were not noted.

Discussion. *Gaertnera drakeana* is an infrequently collected but locally common species that is apparently restricted to Mananara-Nord and Masoala National Parks in northeastern Madagascar. The species is diagnosed by its stipules drying membranous and its relatively small subglobose inflorescences. The species is similar to *G. sralensis* of southeastern Asia, but differs from that in the absence of a hair-ring in the calyx tube and its larger flowers.

Representative specimens examined. MADAGASCAR. **Toamasina:** Mananara-Nord Nature Reserve, *Raharimalala* 1502 (P); Masoala National Park, *Malcomber* 2802 (MO), 2822 (MO).

20. *Gaertnera edentata* Bojer, Hortus Maurit. 216. 1837. *Sykesia edentata* (Bojer) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Mauritius. Forêts de la Nouvelle Decouverte au Quartier-Militaire & montagnes du Grand-Port, *W. Bojer s.n.* (holotype, P not located; isotypes, G!, MAU!). Figure 10C–I.

Gaertnera petrinensis Verdc., Kew Bull. 37: 538. 1983, syn. nov. TYPE: Mauritius. Petrin, *L. Bernardi* 14794 (holotype, K!; isotypes, G!, P!).

Trees or shrubs, (1–)1.5–3 m tall; branches flattened to terete, glabrous, 2–7.5 mm diam.; internodes (0.4–)0.9–2.8 cm, smooth. Leaf blades 2–10 × (1.1–)1.7–5 cm, elliptic to oblong, apex acuminate or acute, base acute to obtuse or rarely subcordate, drying coriaceous, glabrous; secondary veins visible and flat to prominulous abaxially, 4 to 9 pairs; domatia absent; petioles 2.5–20(–30) mm. Stipules tubular, glabrous to puberulent, drying chartaceous, caducous or persistent on distalmost 1 to 4 nodes, tube 2–5 mm, with ribs 4, narrowly winged, arising below petiole and sometimes extending to lobes, apex entire, marcescent, lobes 4, 3–4(–8) mm, linear; setae absent or 2 to 6, 1–3 mm. Inflorescences cymose to subcapitate, (few-to) many-flowered, terminal on principal and/or axillary branches, glabrous; peduncle 0.7–3.5 cm; branched portion corymbiform, (1–)2–4 × (2–)3–6 cm, branched to 2 to 3 orders, congested; bracts deltate or trifid, 2–15 mm, glabrous; bracteoles inserted at base of calyx, ovate to triangular, 1–2 mm; pedicels absent or to 1 mm. Flowers 5-merous, heterodistylous. Long-styled flowers: calyx cup-shaped, 3–5 mm wide, glabrous, truncate or lobes to 0.6 mm, triangular; corolla white, in bud clavate, lobed apically with linear to elliptic appendages 1–2 mm, when open infundibuliform or salverform, outside glabrous, tube 10–25 mm, 4–6 mm diam., inside glabrous or villous in upper third, lobes 7–10 mm, ligulate to linear, acute; anthers included, filaments inserted in upper third of corolla tube, ca. 1 mm; style 9–25 mm, glabrous, stigma 1–4 mm.

Short-styled flowers: similar to long styled except corolla tube 11–25 mm, 3–5 mm diam., lobes 8–10 mm; anthers shortly exserted, filaments inserted in upper third of corolla tube, ca. 2 mm; style 5–9 mm, glabrous, stigma 1–2.5 mm. Drupes white (Bojer, 1837) or violet-black to blue, ellipsoid, 6–10 × 5–7 mm; pyrenes ellipsoid or hemispherical to plano-convex, rugose, finely fissured, endosperm ruminate.

Distribution and habitat. This species grows in Mauritius, where it is found in evergreen wet forests and in the heathlike vegetation found on lava (“groundwater laterite”) at elevations of 300–700 m.

Phenology. This species has been collected with flowers January through May and October through December, and with fruits May through September.

Discussion. *Gaertnera edentata* is an attractive species with the largest flowers in the genus. The apex of the stipule may or may not have setae, but four lobes are consistently present. This species differs from *G. hirtiflora* in its externally glabrous corolla, and from *G. psychotrioides* in its congested rather than lax inflorescences and larger flowers. The label data of *Lorence* 1554 and 2201 note that the flowers are fragrant; these were collected in the middle of the day (D. H. Lorence, pers. comm.).

Verdcourt (1989) separated *Gaertnera petrinensis* as a relatively localized species or form found in the heathlike vegetation that grows on lava flora on Mauritius. He separated this based on its calyx 3–4 mm long and undulate to shortly lobed, with the lobes up to 1 mm long versus 4–5 mm long and truncate to undulate in his circumscription of *G. edentata*. However, the variation in these features on the species studied appears to be continuous and not correlated with habitat. At least one other *Gaertnera* species as circumscribed by Verdcourt and in this treatment is found in both wet forests and the low heathlike vegetation (*G. psychotrioides*), and this name is considered a synonym here.

Representative specimens examined. MAURITIUS. Curepipe, *Vaughan* MAU 1636 (MAU); Perrier Nature Reserve, *Tirvengadam* 28 (P), *Vaughan* MAU 14222 (MAU); Plaine Champagne, *Lorence* 2201 (MAU, MO, P), 4423 (MO); Black River Gorges National Park, *Malcomber* 2941 (MO), 2942 (MO), 2943 (MO), 2944 (MO), 2945 (MO), 2948 (MO), 2950 (MO), 2954 (MO), 2960 (MO), 2961 (MO), 2962 (MO), 2963 (MO); Petrin Reserve, *Lorence* 131 (MO), 1554 (MO), 2376 (MO), 2613 (MO), *Tirvengadam* 394/44 (MAU, US).

21. *Gaertnera eketensis* Wernham, J. Bot. 52: 30. 1914. TYPE: Nigeria. South Eastern State [Akwa Ibom]: Eket Distr., 1912–1913, *P. A. Talbot* 3391 (holotype, BM! isotype, K!).

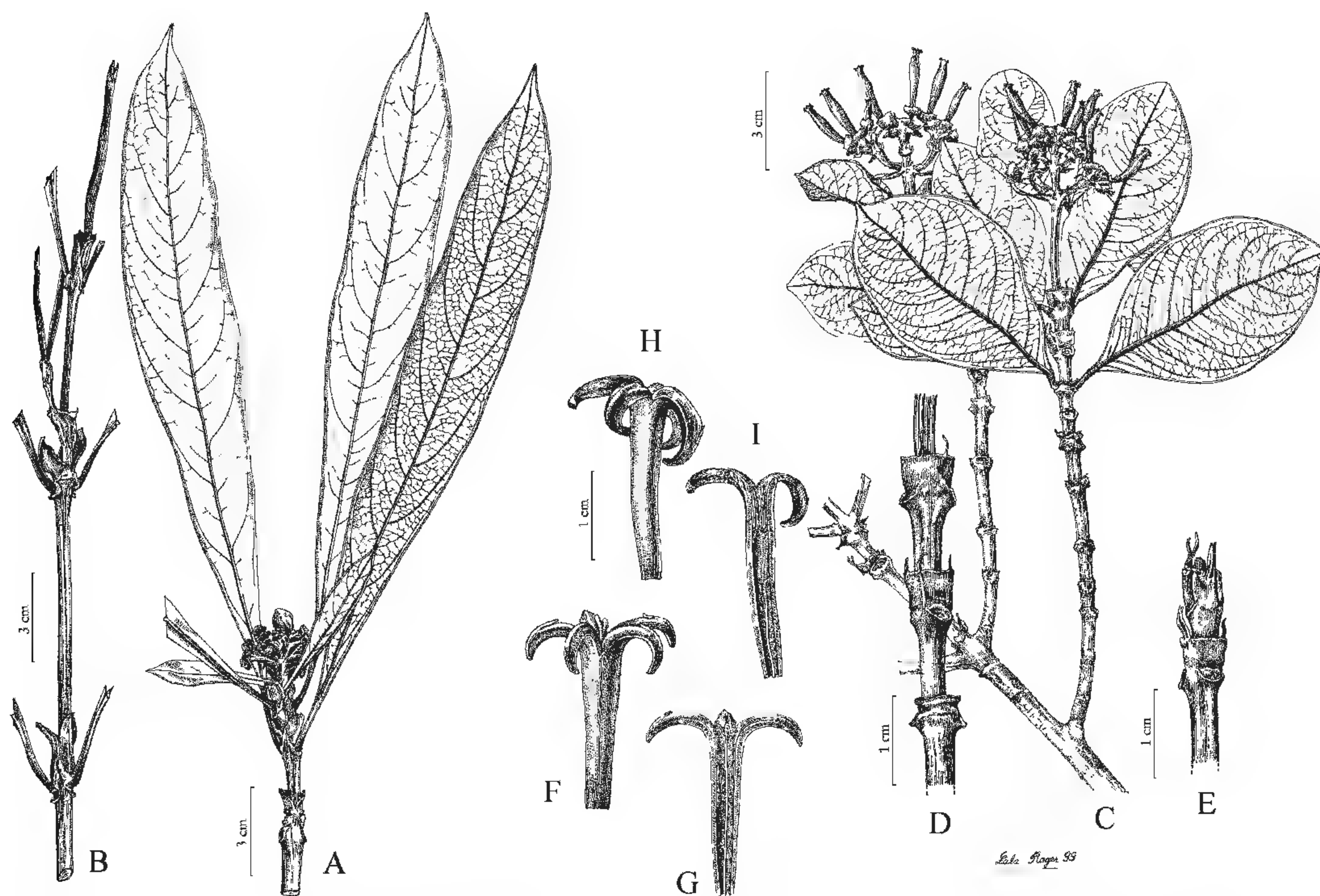


Figure 10. A, B. *Gaertnera globigera* Beusekom. —A. Fruiting branch. —B. Portion of stem with petiole bases, stipules, and stem apex with young leaves. C–I. *Gaertnera edentata* Bojer. —C. Flowering branch (to 3-cm scale). —D, E. Portions of stems with stipules. —F. Long-styled flower. —G. Long-styled flower in cross section. —H. Short-styled flower. —I. Short-styled flower in cross section. F–I to same 1-cm scale. A, B based on *Malcomber* 3038; C–I based on *Malcomber* 2954.

Trees, height not noted; bark with longitudinal striations or fissures; *branches* terete, glabrous, 1.5–3 mm diam.; internodes 1.6–5 cm, smooth to shortly ridged. *Leaf* blades 8–12 × 3–4 cm, elliptic to obovate, apex cuspidate or acuminate, base cuneate, drying chartaceous, glabrous; secondary veins visible abaxially, 4 to 6 pairs; domatia present; petioles 3–6 mm. *Stipules* tubular, glabrous, drying membranous, caducous, tube 4–10 mm, with ribs 6, 4 of them narrowly winged, arising below petiole and extending to lobes, 2 ribs extending from longitudinal ribs of internodes to apex between lobes, apex entire, marcescent, lobes 4, 4–6 mm, linear to filiform; setae numerous, 0.5–2 mm. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches, sparsely puberulent to glabrescent, sessile or peduncle to 4.2 cm; branched portion corymbiform, 3–5.5 × 3–7 cm, branched to 3 to 4 orders, lax; bracts deltate or trifid, 1–4.5 mm; bracteoles reduced; pedicels absent or to 0.8 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 1.1–2 mm wide, glabrous, truncate or lobes to 0.6 mm, triangular; corolla white, clavate in bud, when open salverform, externally glabrous, tube ca. 3.5 mm, 0.8–2 mm diam., inside villous in upper

third, lobes 2.5–3 mm, triangular to ligulate, acute; anthers shortly exserted, filaments inserted in upper third of corolla tube, 0.1–0.3 mm; style 2.7–3 mm, glabrous, stigma 0.6–1 mm. *Short-styled flowers*: unknown. *Drupe*s unknown.

Distribution and habitat. This species grows in West Africa, where it is found to the east of the Dahomey Gap in Nigeria. Here, it can be found in humid lowland forests, but the elevations at which it has been found have not been recorded.

Phenology. This species has been collected with flowers in April and May but has not yet been found with fruits.

Discussion. This poorly known species is so far documented in three collections. Hutchinson and Dalziel (1937) considered *Gaertnera eketensis* a synonym of *G. paniculata*, but, as noted by Petit (1959b), these are distinct. The stipules with numerous setae and the brown-black bark with prominent longitudinal fissures distinguish this species from *G. paniculata*, which lacks both of those features. *Gaertnera eketensis* is similar to *G. liberiensis*, as also noted by Petit (1959b); see comments about their separation under this latter species. Petit also considered *G. eketensis* similar to *G.*

stictophylla (Hiern) E. M. A. Petit; however, the identity of the latter has not been established here, and that name is treated here as doubtful as to application.

Additional specimens examined. NIGERIA. **South Eastern State [Akwa Ibom]:** 30 km E of Eket, Stubbs Creek Forest Reserve, *van Meer 1174* (WAG), *Onochie FIH 33168* (WAG).

22. *Gaertnera fractiflexa* Beusekom, *Blumea* 15: 375, fig. 8A–C. 1968. TYPE: Malaysia. Sarawak: Matang, Peakes Tea Plantation, 18 July 1890, *M. R. Haviland s.n.* (holotype, SING!).

Shrubs, 2–5 m tall; *branches* terete, glabrous, 1.5–3 mm diam.; internodes 0.5–5 cm, smooth. *Leaf* blades 4–16 × 1–4 cm, lanceolate to elliptic or narrowly elliptic-oblong, apex cuspidate or acuminate, base cuneate, drying chartaceous, glabrous; secondary veins prominulous abaxially, 4 to 8 pairs; domatia absent; petioles 3–13 mm. *Stipules* tubular, glabrous to puberulent, drying membranous, deciduous through fragmentation, tube 7–15 mm, with ribs 4, narrowly winged, arising below petiole and sometimes extending to lobes; apex with 2 incisions, marcescent, lobes 4, ca. 3 mm, deltate. *Inflorescences* cymose, many-flowered, terminal on axillary branches, glabrous, pendulous; peduncle 2.5–7 cm; branched portion broadly pyramidal, 3–11 × 3–9 cm, lax, branched to 3 to 4 orders, bracts deltate or linear, 3–30 mm; bracteoles reduced; pedicels absent or to 3 mm. *Flowers* 4-merous, unisexual. *Pistillate flowers*: calyx cup-shaped, 1.5–2.5 mm wide, outside glabrous, with hair-ring inside, truncate or lobes to 0.3 mm, triangular; corolla, staminodes, and stigmas unknown. *Staminate flowers*: calyx similar to pistillate as far as known; corolla white, clavate in bud, when open salverform, externally glabrous, tube 2–4 mm, 0.75–1.5 mm diam., inside villous in upper third, lobes 2–3 mm, ligulate, acute; anthers included, filaments inserted in upper third of corolla tube, ca. 2.5 mm; pistillode poorly developed. *Drupe*s violet-black, globose or subglobose, 5–7 × 5–8 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Southeast Asia, where it is known from Borneo, in the Sarawak (Malaysia) sector. Here, it can be found in humid forests at an elevation of ca. 145 m.

Phenology. This species has been collected with flowers, but the date of that collection was not noted; it has been collected with fruits in June.

Discussion. *Gaertnera fractiflexa* is similar to *G. junghuhniana* but differs in its pendulous, pyramidal inflorescence and 4-merous flowers. *Gaertnera fracti-*

flexa was described by van Beusekom (1967) based on only one collection, suggesting that the species might be rare and possibly now extinct, but recent fieldwork shows that *G. fractiflexa* is still extant at the type locality, although the population was limited in size and scattered.

Additional specimens examined. MALAYSIA. **Sarawak:** Matang, water catchment area, trail to Sri Maha Mariamman temple, *Malcomber 3033* (MO).

23. *Gaertnera furcellata* (Baill. ex Vatke) Malcomber & A. P. Davis, *Monogr. Syst. Bot. Missouri Bot. Gard.* 104: 386, fig. 2. 2005. Basionym: *Psychotria furcellata* Baill. ex Vatke, *Abh. Naturwiss. Vereine Bremen* 9: 118. 1885. TYPE: Madagascar. s. loc., 24 Nov. 1877, *D. C. Rutenberg s.n.* (holotype, P!).

Shrubs, to 2 m tall; *branches* terete, glabrous, 1–2 mm diam.; internodes 0.5–1.2 cm, with 2 longitudinal ribs. *Leaf* blades 0.5–1.2 × 0.3–0.5 cm, elliptic, apex acute to shortly cuspidate, base cuneate, drying membranous or chartaceous, glabrous; secondary veins not or poorly visible abaxially, 3 to 4 pairs; domatia absent; petioles absent or to 0.3 mm. *Stipules* tubular, glabrous, drying membranous, persistent whole or as 4 spatulate shreds, tube absent or up to 1 mm, with ribs 4, narrowly winged, arising below petiole and extending to lobes, apex with 4 incisions, lobes 4, 3–4 mm, linear to filiform. *Inflorescences* reduced to a single flower, terminal on axillary branches, sessile or with peduncles to 1 mm; bracteoles reduced. *Flowers* 4-merous, heterodistylous. *Long-styled flowers*: calyx campanulate, 1.5–2 mm wide, outside glabrous, with hair-ring inside, lobes 0.5–2.5 mm, triangular to linear; corolla white, clavate in bud, when open salverform, outside glabrous, tube 2.5–3 mm, 1.2–1.7 mm diam., inside villous in upper third, lobes 2.2–2.8 mm, ligulate to linear, acute or rounded; anthers included, filaments inserted in upper third of corolla tube, ca. 0.3 mm; style ca. 5 mm, glabrous, stigma 0.5–0.7 mm. *Short-styled flowers*: unknown. *Drupe*s unknown.

Distribution and habitat. This species grows in Madagascar, where it is known from Toamasina Province. Here, it can be found in evergreen humid forests on metamorphic and igneous rocks at an elevation of ca. 900 m.

Phenology. This species has been collected with flowers in November, but has not yet been collected with fruits.

Discussion. *Gaertnera furcellata* is similar to *G. microphylla*. These poorly known species share calyptrate stipules that usually persist as four mem-

branous shreds at the leaf nodes and inflorescences reduced to a single flower; for further discussion, see the section for this latter species. This species was treated under the unpublished name “*Gaertnera lacerata*” by Malcomber (2000). Malcomber and Davis (2005) considered the conservation status of this species to be Critically Endangered (IUCN, 2001).

Additional specimens examined. MADAGASCAR. **Toamasina:** Samalahaza, Ambatondrazaka, *Cours 1203* (P), *Dequaire 27977* (K, P).

24. *Gaertnera gabonensis* Malcomber, sp. nov.
TYPE: Gabon. Iwateki, 15 Dec. 1930, *G. Le Testu 8575* (holotype, P!; isotypes, BM!, BR!, MO!).

Haec species *Gaertnerae spicatae* K. Schum. similis, sed ab ea inflorescentia thyrsiformi atque calyce dense puberulo vel pilosulo distinguitur.

Trees or shrubs; *branches* terete to $\pm$ tetragonal, hollow, densely puberulent or pilosulose to glabrescent, 3–6 mm diam.; internodes 7–9 cm, smooth. *Leaf* blades 21–30 $\times$ 8–11 cm, oblanceolate to elliptic-oblong, apex rounded then abruptly shortly cuspidate, base cuneate to obtuse, drying stiffly chartaceous, glabrous; secondary veins prominulous abaxially, 8 to 10 pairs; domatia absent; petioles 15–25 mm. *Stipules* tubular, densely hirtellous or pilosulose to glabrous, drying chartaceous, deciduous through fragmentation, tube 15–25 mm, with ribs 4, broadly winged, arising below petiole and extending to lobes, apex with 2 incisions, marcescent, lobes 4, 4–8 mm, deltate to linear. *Inflorescences* cymose, many-flowered, terminal on principal branches, puberulent to pilosulose; peduncle 5–9 cm; branched portion corymbiform to broadly pyramidal, 4.5–10 $\times$ 4–8 cm, branched to 3 to 5 orders, rather congested; bracts deltate or trifid, 5–12 mm; bracteoles reduced. *Flowers* 5-merous, bisexual, heterodistylous, subsessile. *Long-styled flowers:* calyx cup-shaped, 2–3.5 mm wide, outside densely puberulent to pilosulose, glabrous inside, truncate or lobes to 1.2 mm, triangular to linear; corolla white, clavate in bud, when open salverform, outside densely puberulent to pilosulose, tube 6–9 mm, 1.4–2.1 mm diam., inside villous in upper third, lobes 3.5–4.5 mm, elliptic-oblong, acute; anthers included, filaments inserted in upper third of corolla tube, ca. 0.3 mm; style 7–9 mm, glabrous, stigma 1.5–2.5 mm. *Short-styled flowers:* similar to long styled except corolla glabrous outside, tube 7–8.5 mm, 1.1–2 mm diam., inside villous in upper third, lobes 2–3 mm, ligulate; anthers fully exerted, filaments 3–4 mm; style 7–8 mm, stigma 1–1.5 mm. *Drupe*s unknown.

Distribution and habitat. This species grows in Central Africa, where it is known from Gabon. Here, it

can be found in humid forests at elevations of 30–700 m.

Phenology. This species has been collected with flowers September through December, and with fruits in January, November, and December.

Discussion. *Gaertnera gabonensis* is often confused with *G. spicata*, but differs in the absence of stipule setae, its corymbiform to broadly pyramidal inflorescences, and its densely puberulent to pilosulose calyx tubes. The specific epithet refers to the geographic distribution, which is apparently restricted to Gabon.

Paratypes. GABON. **Ngounié:** Betw. Mouila & Yeno, 60 km from Mouila, *Breteler 8029* (K, WAG). **Nyanga:** Mayombe bayaka, Issala, *Le Testu 1642* (BM, BR, P); Near Rabi, *Van Nek 569* (WAG). **Ogooué Maritime:** Rabi-Kounga, *Breteler 10214* (WAG), 9 Nov. 1991, *Schoenmaker 117* (WAG), 4 km N of Shell camp, *Wieringa 1654* (WAG).

25. *Gaertnera* $\times$ *gardneri* Thwaites, Enum. Pl. Zeyl. 202. 1864. *Gaertnera walkeri* var. *gardneri* (Thwaites) C. B. Clarke, in Hook. f., Fl. Brit. India 4: 92. 1883. TYPE: Sri Lanka. Central Province: Adam’s Peak, *G. H. K. Thwaites CP 346* (lectotype, designated by van Beusekom, 1967 [1968]: 380, BM!; isotypes, G!, PDA!, W!). [SYNTYPE: Sri Lanka, *G. H. K. Thwaites CP 363* (K!).]

Trees, 2–4 m tall; *branches* terete to flattened or trigonous, when young puberulent or hirtellous to glabrous with indumentum drying yellow or gray-white, becoming glabrescent, 1–5 mm diam.; internodes 0.6–1.5(–2.4) cm, smooth or with 2 or 3 longitudinal ribs. *Leaves* paired or ternate; blades 1.5–3.7(–4.7) $\times$ 0.4–0.8(–1.2) cm, narrowly elliptic to linear-lanceolate, apex cuspidate, base attenuate to cuneate, drying chartaceous, glabrous, margin flat to thinly revolute; secondary veins invisible or visible but flat abaxially, 3 to 6 pairs; domatia absent; petioles 1–3 mm. *Stipules* tubular, glabrous to puberulent, drying chartaceous, caducous or infrequently slowly deciduous, tube 1.2–3 mm, with ribs 2 or 3 with 1 rib on each side extending from internode rib to stipule lobe, sometimes also with narrow wings arising from base of petiole, apex with 2 or 3 incisions, marcescent, lobes 2(4) or 3(6), 0.2–1 mm, deltate to linear. *Inflorescences* cymose and few-flowered or reduced to 1 flower, terminal on axillary branches, puberulent to hirtellous or glabrescent, pendulous, sessile or peduncle to 7 mm; branched portion when present corymbiform, 0.5–2.5 $\times$ 0.5–4.8 cm, lax, branched to 1 to 2 orders; bracts deltate or linear, 1–5 mm; bracteoles reduced; pedicels 2–6.5 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers:*

calyx cup-shaped, 3–3.5 mm wide, outside glabrous or puberulent, sometimes with hair-ring inside, lobes 0.8–2 mm, triangular to linear; corolla white, clavate in bud, when open salverform, outside glabrous, tube 8–10 mm, 1.3–3.5 mm diam., inside villous at ca. middle, lobes 3–4 mm, triangular or ligulate, acute; anthers included, filaments inserted at ca. middle of corolla tube, ca. 0.1 mm; style 9–11 mm, glabrous or pubescent, stigma 0.5–1 mm. *Short-styled flowers*: similar to long styled except calyx 2.5–3.5 mm wide, lobes 1–2 mm; corolla tube 9.5–10.5 mm, 3.5–4.5 mm diam., lobes 3.5–4 mm; anthers shortly exerted, filaments 1.5–2 mm; style 5.5–6.5 mm, glabrous, stigma 1.5–2 mm. *Drapes* violet-black, globose to subglobose or didymous, 6–7 × 6–9 mm; pyrenes spherical to hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This natural hybrid is known only from Sri Lanka. Here, it can be found in wet montane forests at elevations of 1400–1630 m.

Phenology. This natural hybrid has been collected with flowers April through August and has been collected with fruits, but the months of those collections were not noted.

Discussion. Although this has previously been treated as either a biological species or a synonymous name, *Gaertnera* × *gardneri* is here considered a natural hybrid between *G. walkeri* and *G. ternifolia*. Van Beusekom (1967) discussed the numerous morphologically irregular, apparently intermediate forms that link these two species and concluded that these are hybrids, but he did not formally recognize or circumscribe them. These hybrids can be recognized by their usually variable leaf arrangement, opposite and ternate on the same plants and often on the same stems, and their leaves and stipules of intermediate form. Whether these apparent hybrids are fertile is unknown. *Gaertnera* × *gardneri* is most often confused with *G. ternifolia*, but differs from that in the presence of both opposite and ternate leaves on a single stem, broader leaf blades, and salverform corollas.

Representative specimens examined. SRI LANKA. **Kandy:** Fairlawn Estate, Meriyakota, Peak Wilderness, *Jayasuriya* 2841 (A, PDA). **Nuwara Eliya:** Peak Wilderness National Park, lower slopes of Adam's Peak (Sri Pada), *Malcomber* 2768 (MO, PDA), 2769 (MO, PDA).

26. *Gaertnera globigera* Beusekom, *Blumea* 15: 379, fig. 8L. 1968. TYPE: Malaysia. Sarawak: Sibul Distr., path from Agricultural Station Rantau Panjang to Teku, *J. A. R. Anderson* S. 9863 (holotype, SAR!). Figure 10A, B.

Trees, 2–6 m tall; branches flattened near stem apex, otherwise terete, when young glabrous or

puberulent or pilosulose with indumentum drying yellow to white, becoming glabrescent, 3–6 mm diam.; internodes 2.5–9 cm, smooth or with 2 longitudinal ribs. *Leaf* blades 15–25 × 2.5–5 cm, lanceolate, narrowly elliptic, or narrowly elliptic-lanceolate, apex acuminate or acute, base acute, drying coriaceous, glabrous, margin flat to thinly revolute; secondary veins prominulous abaxially, 6 to 10 pairs; domatia absent; petioles 15–30 mm. *Stipules* tubular, glabrous, drying chartaceous, persistent, tube 5–25 mm, with ribs 4, broadly winged, arising below petiole and extending to apex; apex with 1 or 2 incisions, persistent or sometimes fragmenting, lobes absent or 4, ca. 0.3 mm, deltate. *Inflorescences* congested-cymose, many-flowered, terminal on principal branches, glabrous to densely hirtellous, sessile or subsessile, subglobose, 1–3.5 × 1–3.5 cm, branched to 3 to 4 orders; bracts deltate, 0.5–2 mm; bracteoles reduced. *Flowers* 5-merous, subsessile, floral biology unknown. *Calyx* cup-shaped, 2.2–3.5 mm wide, outside pilosulose to glabrous, glabrous inside, truncate or lobes to 0.5 mm long, triangular; corolla, stamens, and stigmas unknown. *Drapes* unknown.

Distribution and habitat. This species grows in Southeast Asia, where it is known from Borneo in the Sarawak (Malaysia) sector. Here, it can be found in humid forests at an elevation of ca. 30 m.

Phenology. This species has been collected with flowers in June and has not been collected with fruits.

Discussion. Van Beusekom (1967) reported that *Gaertnera globigera* was found in both laterite forest and “kerangas” forests on white sand substrates in Bako National Park, Sarawak, Malaysia, on Borneo, based on a note on the type label. However, despite intensive documentation of the plants of this park, *G. globigera* has not been rediscovered there and overall is still only known from the type locality in Rantau Panjang Forest Reserve. Both collections seen of *G. globigera* lack mature flowers and fruit, but the species can be easily recognized by its relatively long, lanceolate to narrowly elliptic or narrowly lanceolate-elliptic leaves, its distinctive broadly winged stipules, and its subglobose inflorescences.

In the protologue, the collector of the type specimen was not listed but cited as “? collector, Sarawak 9863”; the name of this collector is J. A. R. Anderson based on records from SAR.

Additional specimen examined. MALAYSIA. **Sarawak:** Sibul Distr., 1.43 km ENE of Rantau Panjang Forest Reserve, *Malcomber* 3038 (MO).

27. *Gaertnera grisea* Hook. f. ex C. B. Clarke, in Hook. f., *Fl. Brit. India* 4: 92. 1855. *Sykesia grisea* (C. B. Clarke) Kuntze, *Revis. Gen. Pl.* 2:

425. 1891. TYPE: Singapore, *N. Wallich 8389* (holotype, K!; isotypes, BM!, K!).

Trees or shrubs, 2–8 m tall; *branches* flattened near stem apex, otherwise terete to quadrangular, when young densely velutinous to pilosulose with indumentum drying pale yellow or gray-white becoming glabrescent, 3–5 mm diam.; internodes 2–10 cm, smooth. *Leaf* blades 9–30 × 4–12 cm, elliptic to oblanceolate or obovate, apex cuspidate or acuminate, base cuneate to obtuse, drying coriaceous, adaxially glabrous, abaxially densely velutinous to hirtellous with indumentum drying pale yellow or gray-white; secondary veins prominent abaxially, 7 to 11 pairs; domatia absent or present; petioles 7–18 mm. *Stipules* tubular, densely velutinous to pilosulose, drying chartaceous, persistent at least on distalmost nodes, tube 12–22 mm, with ribs 4, narrowly winged, arising below petiole and sometimes extending partway along sheath to lobes, apex entire, marcescent or fragmenting, lobes 4, 3–7 mm, deltate to linear. *Inflorescences* cymose, many-flowered, terminal on axillary branches, densely velutinous; peduncle 3.5–5.5 cm; branched portion corymbiform, 5–12.5 × 5–10 cm, lax to congested, branched to 3 to 4 orders; bracts narrowly deltate or linear, 4–6 mm; bracteoles reduced. *Flowers* 5-merous, unisexual, subsessile. *Pistillate flowers*: calyx cup-shaped, 3–4 mm wide, outside densely puberulent to velutinous, with hairing inside, truncate or lobes to 0.5 mm, broadly triangular; corolla white, clavate in bud, when open salverform, outside densely puberulent, tube 5–7 mm, 1.5–2.5 mm diam., inside villous in upper third, lobes 2.5–4 mm, ligulate to ovate-oblong, acute; staminodia shortly exserted, filaments inserted in upper third of corolla tube, ca. 0.5 mm; style 6–6.5 mm, glabrous, stigma 2–2.5 mm. *Staminate flowers*: similar to pistillate except corolla tube 6.5–8.5 mm, 2–3 mm diam., lobes 3–4 mm; anthers shortly exserted, filaments 0.5–1 mm; style rudimentary. *Drapes* violet-black, globose or didymous, 5–7 × 5–7 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Southeast Asia, where it is known from Peninsular Malaysia, Singapore, and the Riau Archipelago of Indonesia, near Singapore. Here, it is found in humid forests at elevations of 0–150 m.

Phenology. This species has been collected with flowers January through July and in November and December, and with fruits January through August.

Discussion. *Gaertnera grisea* is a locally common species. Most of the collections are from Bukit Timah

in Singapore. *Gaertnera grisea* can be recognized by its pale yellow or gray-white dried pubescence, tubular stipules with narrow stipule wings encircling the petiole that do not extend through to the top of the tube, and truncate to very shortly lobed calyx.

Additional specimens examined. INDONESIA. **Riau** [Riau] **Archipelago**: Geliga, *Bünnemeyer 6512* (K, L, SING). MALAYSIA. **Negeri Sembilan**: Passir Panjang, *Ridley 13337* (BM, SING). SINGAPORE. Bukit Panjang, *Ridley 12528* (BM, K, SING).

28. *Gaertnera guillotii* Hochr., *Annuaire Conserv. Jard. Bot. Genève*, 11–12: 115. 1908, non *Gaertnera guillotii* (Hochr.) Bremek., 1963. TYPE: Madagascar. Toamasina: Distr. de Vatoman-dry près d'Analatsara, 3 Oct. 1903, *J. Guillot 36* (holotype, G!; isotype, K!). Figure 9H–N.

Trees, 2–8(–15) m tall; *branches* terete to quadrangular, when dry usually dark purple-black, glabrous, 1.5–4 mm diam.; internodes 0.5–8.5 cm, smooth. *Leaf* blades 1.7–13.2 × 0.7–4.6 cm, elliptic to oblanceolate or elliptic-oblong, apex rounded then shortly cuspidate to acuminate, base cuneate to obtuse, drying chartaceous, glabrous; secondary veins visible and flat to prominulous abaxially, 5 to 8(9) pairs; domatia present; petioles 5–9 mm. *Stipules* calyptrate, often becoming inflated prior to rupturing as tip elongates, glabrous outside, strigillose to sericeous inside, drying membranous, caducous, tube 11–49 mm, with ribs 4, rounded, arising above petiole and sometimes extending to top of sheath, wings under petiole base usually tardily developing after stipule tube falls and without connection to stipule ridges, apex with 1 incision, lobes 2, 1.2–3.7 mm, deltate. *Inflorescences* cymose, many-flowered, terminal on axillary branches, glabrous to puberulent or pilosulose with pubescence sometimes in lines; peduncle 0.5–2.2 cm; branched portion corymbiform, 0.6–7 × 0.8–6.2 cm, branched to 3 to 4 orders, lax to congested; bracts deltate or linear, 0.8–2 mm; bracteoles triangular to rounded, 0.5–1.5 mm, often laciniate; pedicels absent or up to 1.8 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 1.5–2.5 mm wide, glabrous, lobes 0.1–0.2 mm, triangular; corolla white, clavate in bud, when open salverform, outside glabrous, tube 3.5–4.5 mm, 1.5–3 mm diam., inside villous in upper third, lobes 2.5–3 mm, triangular or ligulate, acute; anthers included, filaments inserted in upper third of corolla tube, 0.3–0.7 mm; style 4.5–5.5 mm, glabrous, stigma 0.5–0.7 mm. *Short-styled flowers*: similar to long styled except corolla tube 1.3–3 mm diam., lobes 2–3 mm; anthers shortly exserted, filaments 2–2.5 mm; style 2.4–3 mm, stigma 0.8–1 mm. *Drapes* violet-black, subglobose or didymous, 4.5–5.5 × 4.5–

5.5 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is known from Antsiranana, Fianarantsoa, Toamasina, and Toliara provinces. Here, it is widespread along the east coast of this island continent in humid forests at elevations of 0–25 m but occasionally up to elevations of 750 m; it usually can be found in littoral forests on white sand.

Phenology. This species has been collected with flowers May through December, and with fruits January through April and in November and December.

Discussion. *Gaertnera guillotii* is similar to *G. obovata*, but can be separated by its combination of elliptic to oblanceolate or elliptic-oblong leaves with flat margins, inflorescences with often pubescent axes, white flowers, and a habitat on white sand substrates and usually in littoral vegetation. The young branches usually drying dark purple-black are distinctive and helpful to recognize this species but are not exclusive to it; similarly colored dry branches are found in several other taxa, notably *G. obovata* var. *sphaerocarpa* (e.g., Malcomber et al. 2016, MO).

A group of specimens from the littoral forests in the northern part of Madagascar (Antsiranana and Toamasina) generally matches *Gaertnera guillotii*, but lacks domatia on the undersides of the leaves and has larger calyx lobes, to 1 mm long (e.g., Rabevohitra et al. 4195). These specimens are provisionally included here in *G. guillotii* pending further study.

Representative specimens examined. MADAGASCAR. **Antsiranana:** Near Antalaha, Imbert 94 (MO, P), Ranjokiny RN 8860 (MO, TAN), Unknown Collector RN 8898 (TAN); Sambava, Humbert 24378 (P). **Fianarantsoa:** Farafangana, Tohakandro, Capuron SF 23658 bis (MO, P, TEF); Mananjary, Geay 7719 (P). **Toamasina:** Ambila Lemaintso, Malcomber 2913 (MO, TEF), Ralarivohita SF 1103 (P, TAN, TEF); Ambodiriana, Cours 1943 (P, TAN); Mananara-Nord National Park, Raharimalala 317 (MO), Dumetz 858 (MO). **Toliara:** Betw. Antandrainiminty & Ambodisakona, Randrianasolo 288 (K, MO, TAN); Fort Dauphin, Decary 11066 (P), Humbert 5999 (P), Rabevohitra 2159 (MO, P, TAN), McPherson 14146 (MO, P, TAN, TEF).

29. *Gaertnera hirtiflora* Verdc., Kew Bull. 37: 535. 1983. TYPE: Mauritius. Plaines Wilhems Distr.: Macabé, 540 m, Aug. 1980, C. Puff 800825-1/10 (holotype, WU!; isotype, K!).

Trees, 5–7.5 m tall; branches flattened to terete, glabrous, 3–5 mm diam.; internodes 1.5–3.5 cm, smooth. Leaf blades 4–11 × 1.5–4.5 cm, elliptic or oblanceolate to obovate, apex obtuse and shortly cuspidate or acuminate, base acute to cuneate, drying

coriaceous or chartaceous, glabrous; secondary veins prominulous abaxially, 4 to 8 pairs; domatia present; petioles 2–12 mm. Stipules tubular, glabrous to densely puberulent, drying chartaceous, persistent at least on distalmost 3 to 6 nodes, tube 5–12 mm, with ribs 4, narrowly winged, arising below petiole, angling toward middle of interpetiolar side of tube then extending to lobes, apex entire, lobes 4, 4–6 mm, filiform; setae 4 to 10, linear, 3–7 mm. Inflorescences cymose, many-flowered, terminal, puberulent to glabrescent; peduncle 1–4 cm; branched portion corymbiform, 2.5–6 × 1.5–6 cm, branched to 2 to 4 orders, generally congested; bracts ovate, linear, or fused and trifold, 2–6 mm; bracteoles triangular to ovate, 1–2 mm; pedicel absent or to 3 mm. Flowers 5-merous, heterodistylous. Long-styled flowers: calyx cup-shaped or campanulate, 2.5–4 mm wide, puberulent outside, inside glabrous, lobes 1–2.5 mm, triangular to ovate; corolla white, clavate in bud, outside puberulent, tubular-salverform when open, externally densely puberulent to velutinous, tube ca. 13 mm, 1–1.5 mm diam., inside villous in throat, lobes narrowly elliptic-oblong, ca. 5.5 mm; stamens inserted in upper part of corolla tube, anthers subsessile, included or partially exserted; style ca. 13 mm, stigmas ca. 2 mm, exserted. Short-styled flowers: unknown. Drupes unknown.

Distribution and habitat. This species grows in Mauritius, where it is found in medium to tall wet evergreen forests (D. H. Lorence, pers. comm.) at elevations of 500–700 m.

Phenology. This species has been collected with flowers August through December, but has not been collected with fruits.

Discussion. *Gaertnera hirtiflora* is similar to both *G. edentata* and *G. psychotrioides*, but can be separated by its tubular stipules with four well-developed linear lobes and several smaller but similar setae and its densely puberulent corolla tubes. The fleshy, white, relatively long flowers were reported on the label of Lorence 1541 to have a fragrance similar to the cultivated gardenia; these were collected at midday (D. Lorence, pers. comm.), but the flowers with these characteristics of nocturnal Rubiaceae flowers may be nocturnal or crepuscular as well.

Representative specimens examined. MAURITIUS. Black River Gorge National Park, S. Malcomber 2937 (MO), 2934 (MO), Vaughan MAU 13042 (MAU); Plaine Champagne, Lorence 1541 (MO).

30. *Gaertnera hispida* Aug. DC., Bull. Herb. Boissier, sér. 2, 1: 585. 1901. TYPE: Madagascar. Toamasina: Maroa [Maroantsetra], A. Moc-

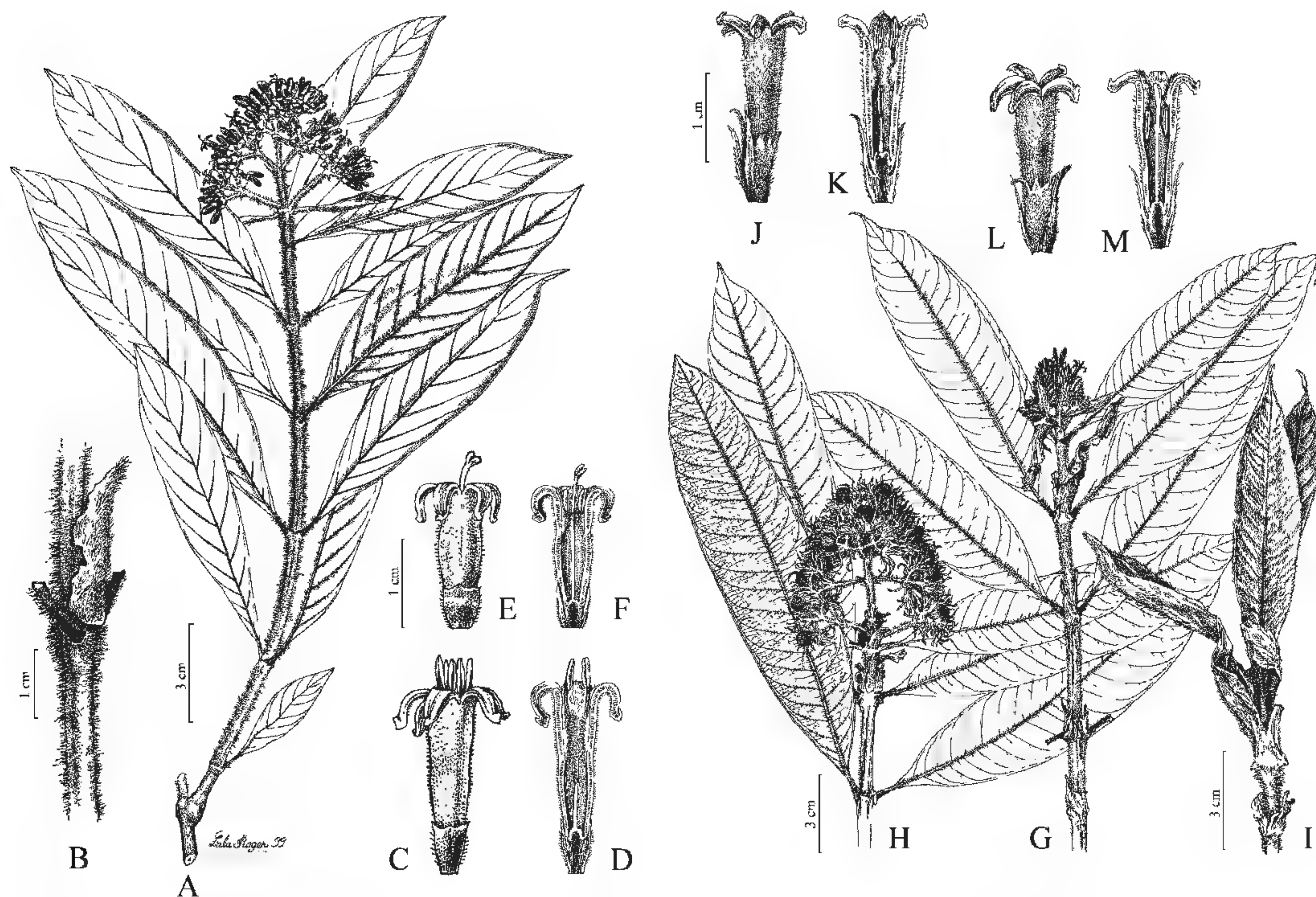


Figure 11. A–F. *Gaertnera hispida* Aug. DC. —A. Flowering branch. —B. Portion of stem with petiole bases and stipules. —C. Short-styled flower. —D. Short-styled flower in cross section. —E. Long-styled flower. —F. Long-styled flower in cross section. G–M. *Gaertnera phanerophlebia* Baker. —G. Flowering branch. —H. Fruiting branch. —I. Portion of stem with stipules and stem apex with young leaves. —J. Short-styled flower. —K. Short-styled flower in cross section. —L. Long-styled flower. —M. Long-styled flower in cross section. C–F to same 1-cm scale; G, H to same 3-cm scale; J–M to same 1-cm scale. A–F based on *Moise 11*; G, I–M based on *Moise 10*; H based on *Malcomber 2830*.

quercus 155 (lectotype, designated here, G-DC!).
Figure 11A–F.

Trees, 2.5–12 m tall; *branches* terete, hispid with indumentum drying red-brown to brown, 2–5 mm diam.; internodes 1.2–8.5 cm, smooth. *Leaf* blades 6.1–16.1 × 1.1–3.1 cm, narrowly elliptic to elliptic-oblong or oblanceolate, apex acute to shortly acuminate, base acute or cuneate, drying chartaceous, adaxially glabrous or sparsely hispid to hirsute on costa and sometimes secondary veins and lamina, abaxially hispid to hirsute with indumentum denser on veins and drying reddish brown to brown; secondary veins prominulous abaxially, 9 to 16 pairs; domatia absent; petioles 2–10 mm. *Stipules* calyptrate, densely hispid to strigose, drying membranous, caducous, tube 11–32 mm, without ribs, apex with 1 incision, lobes 2 or 4, 0.5–2(–4) mm, deltate or linear. *Inflorescences* cymose, many-flowered, terminal on axillary branches, densely villous to villosulous or pilosulose, sessile or peduncle to 5 cm; branched portion corymbiform, 1.8–8.5 × 1.4–8.5 cm, branched to 3 to 5 orders, lax to rather congested; bracts linear to ligulate or deltate, 1.1–6 mm, sometimes glabrous above; bracteoles

reduced; pedicels absent or to 2.5 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 1.7–4 mm wide, puberulent outside, glabrous inside, truncate or lobes to 0.9(–1.5) mm, triangular; corolla white, clavate in bud, when open salverform, outside glabrous to puberulent, tube 8–9.5 mm, 2–3.5 mm diam., inside villous at ca. middle, lobes 2–3.5 mm, triangular or ligulate, acute; anthers included, filaments inserted in upper third of corolla tube, ca. 0.4 mm; style 9–11 mm, glabrous, stigma 0.7–2 mm. *Short-styled flowers*: similar to long styled except calyx 1.5–3.5 mm wide; corolla puberulent outside, tube 6.5–11 mm, 1.5–3 mm diam., lobes 1.5–4 mm; anthers shortly exerted, filaments 3–4.5 mm; style 3–6 mm, stigma 1.5–2.5 mm. *Drupe*s violet-black, globose to subglobose or didymous, 8–14 × 7–14 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it has been found in the province of Toamasina in Mananara-Nord and Masoala National Parks. Here, it can be found in humid forests at elevations of 0–300 m.

Phenology. This species has been collected with flowers in October, and with fruits January through April and in December.

Discussion. *Gaertnera hispida* can be recognized by its calyprate stipules that dry membranous, its hispid indumentum drying reddish brown to brown, and its generally lax corymbiform inflorescence. This species is similar to *G. phanerophlebia*, which differs in its well-developed calyx lobes 2–5 mm long.

Two syntypes were cited in the protologue of *Gaertnera hispida*, A. Mocquerys 155 (G-DC!) and A. Mocquerys 167 (G-DC!). The former is selected here as lectotype because it is a more complete and exemplary specimen.

Representative specimens examined. MADAGASCAR. **Toamasina:** Mananara National Park, 6.4 km W of Antanambe, Malcomber 2897 (MO, TEF), Morat et al. 858 (P), 8613 (MO, P); Masoala National Park, Malcomber 2824 (MO, TEF), 2817 (MO, TEF), 2818 (MO, TEF), Schatz 3314 (K, MO, P, TAN), 3346 (K, MO, P, QRS, TAN).

31. *Gaertnera humblotii* Drake, Bull. Soc. Bot. France 45: 352. 1899. TYPE: Madagascar. NE Madagascar, H. Humblot 655 (holotype, P!; isotypes, MO!, P!, WU!).

Trees or shrubs, 2–10 m tall; *branches* flattened near stem apex, otherwise terete, glabrous, 1.5–4 mm diam.; internodes 1.5–7.5 cm, smooth. *Leaf* blades 4–16.5 × 1–5.5 cm, elliptic-lanceolate or oblanceolate to elliptic, apex cuspidate to acute, base attenuate or cuneate, drying coriaceous, glabrous; secondary veins barely visible and flat to prominulous abaxially, 7 to 10 pairs; domatia absent; petioles 3–20 mm. *Stipules* tubular, glabrous, drying chartaceous, deciduous or usually persistent on at least distalmost 2 to 5 nodes, tube 3–10 mm, with ribs 4, rounded to narrowly winged, arising below petiole and sometimes extending to lobes, apex entire, marcescent, lobes 4, 0.5–1.5 mm, filiform. *Inflorescences* cymose, many-flowered, terminal on axillary branches, glabrous or puberulent; peduncle 1.5–8.8 cm; branched portion corymbiform, 2.5–9(–14.5) × 3–11 cm, branched to 3 to 5 orders, lax to somewhat congested; bracts deltate to narrowly spatulate or trifid, 5–35 mm, white; bracteoles triangular, 1–2 mm, white; pedicels absent or up to 5 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers:* calyx campanulate, 2–3 mm wide, glabrous, lobes unequal, 5–7 mm, narrowly spatulate to narrowly elliptic-oblong, white; corolla white, clavate in bud, when open infundibuliform to salverform, outside glabrous; tube 10–17 mm, 1.5–3 mm diam., inside villous in upper third, lobes 3.5–4 mm, ligulate to linear, acute or rounded; anthers included, filaments inserted in upper third of corolla tube, 0.2–1 mm; style 10–18 mm, glabrous, stigma

1.4–2 mm. *Short-styled flowers:* similar to long styled except calyx 2.2–3 mm wide, lobes 5–6 mm, linear; corolla tube 3–4.5 mm diam., lobes 3.7–5 mm; anthers shortly exerted, filaments 2–4 mm; style 5–7 mm, stigma 4–5 mm. *Drupe*s violet-black, subglobose or didymous, 6–8 × 6.5–8 mm; pyrenes spherical or hemispherical, ± rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is known from the province of Toamasina. Here, it is found in humid forests at elevations of 0–600 m.

Phenology. This species has been collected with flowers in February and with fruits February through April.

Discussion. *Gaertnera humblotii* is an attractive species with distinctive tubular stipules and relatively large, showy, white, mostly narrowly spatulate to narrowly elliptic-oblong inflorescence bracts and calyx lobes. It is similar in general aspect and many details to *G. raphaelii* Malcomber; see additional comments under that species. *Gaertnera humblotii* may hybridize with *G. phanerophlebia*; see comments under that species.

Representative specimens examined. MADAGASCAR. **Toamasina:** Masoala Peninsula, Schatz 2620 (MO, P, TAN); Brickavelle, Peak of Ambalarondra of Andrambolahykel, Andranampony, Cours 4509 (P, TAN); Marojejy Integral Reserve, Randrianasolo 320 (K, MO); Maroantsetra, Schatz 1875 (MO, P, TAN).

32. *Gaertnera ianthina* Malcomber, sp. nov. TYPE: Madagascar. Antsiranana: Marojejy Nature Reserve, near camp 2 on summit trail, 14°26'S, 49°45'E, 800–1000 m, 17 Sep. 1997, S. T. Malcomber 2773 (holotype, MO!; isotypes, A!, BR!, G!, K!, P!, PRE!, TEF!, WAG!). Figure 5G, H.

Haec species *Gaertnerae phanerophlebiae* Baker similis, sed ab ea caule in sectione transversali quadrangulati, indumento in sicco griseoalbo atque corolla pallide roseo-purpurea distinguitur.

Trees or shrubs, 3–10 m tall; *branches* terete to quadrangular, when young densely strigose to pilosulose with indumentum drying gray-white, becoming glabrescent, 1.5–5 mm diam.; internodes 2.5–4 cm, smooth. *Leaf* blades 6–20 × 2–7 cm, elliptic to elliptic-oblong or obovate, apex cuspidate or shortly acuminate, margins crisped, base obtuse to usually cuneate or acute, drying chartaceous, adaxially glabrous or densely pilosulose on costa and sometimes secondary veins, abaxially strigose or hispidulous to hispid on principal veins or throughout with indumentum drying gray-white; secondary veins prominu-

lous abaxially, (8 to) 14 to 20 pairs; domatia absent; petioles 4–9 mm, furrowed and with 2 lateral ridges. *Stipules* calyptrate, densely pilosulose to villosulous, drying membranous, caducous, tube 7–40 mm, with ribs 4, narrowly winged, arising beneath petiole and sometimes extending to lobes, apex with 1 or 2 incisions, lobes 4, 2–3 mm, deltate or linear. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches, villous or pilosulose to strigose or glabrous, sessile or peduncle to 4 cm; branched portion corymbiform, 2.5–6(–8) × 2–7(–9) cm, branched to 3 to 4 orders, lax to congested; bracts ligulate, linear, or trifid, 2–30 mm; bracteoles ligulate, 0.1–2 mm; pedicels absent or to 2.5 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 1.5–2.5 mm wide, outside glabrous or strigillose, with hair-ring inside, lobes 0.5–2.5 mm, triangular, ciliate; corolla pale pink to purple, clavate in bud, when open salverform, outside glabrous, tube 7–9 mm, 2–2.5 mm diam., inside villous in upper third, lobes 3–4 mm, triangular to ligulate, acute; anthers included, filaments inserted in upper third of corolla tube, ca. 0.4 mm; style 7.5–8 mm, glabrous, stigmas 0.8–1 mm. *Short-styled flowers*: similar to long styled except lobes linear; corolla tube 9–10 mm, 1.5–3 mm diam.; anthers shortly exerted, filaments 0.8–1 mm; style 5–6 mm, stigmas 1–1.5 mm. *Drupe*s violet-black or blue, globose or didymous, 6–7.5 × 7–10 mm; pyrenes spherical or hemispherical, faintly rugose, deeply fissured, endosperm entire.

Distribution and habitat. This species grows in northern Madagascar, where it is known from the provinces of Antsiranana and Mahajanga. Here, it grows near Manongarivo, Tsaratanana, and Marojejy in humid forests at elevations of 300–2000 m.

Phenology. This species has been collected with flowers January through May and in December, and with fruits January through June and in November and December.

Discussion. *Gaertnera ianthina* is similar in general aspect to some plants of *G. phanerophlebia*, but differs in its generally quadrangular stems, indumentum drying grayish white, generally lax inflorescences, pink to purple flowers, and shorter calyx lobes.

Paratypes. MADAGASCAR. **Antsiranana:** Andapa, *Christophe* RN 8044 (P, TAN); Andapa, Ambodihassina, *Cours* 3615 (P, TAN); Andapa, Lokoho, Ankobahina Peak, *Humbert* 22024 (P), 21997 (P), 22045 (P); Andapa, Marovato, Antsahamarotoko, *Unknown Collector* SF 21632 (TEF); Anjanaharibe Massif, Andramonta, Lokoho Basin, *Humbert* 24504 (P); Anjanaharibe-Sud Nature Reserve, *Lewis* 1318 (MO, P, TAN); Ankaizina, *Decary* 1949 (P); Lokoho, near Ambalavoniho, *Humbert* 22796 (P), 22817 (P); Manongarivo Nature Reserve, *Perrier de la Bâthie* 3836 (P), *Malcomber*

2710 (MO, P, TAN), *Miller & Lowry* 4050 (MO), *Nicoll* 616 (MO, P, TAN), *Miller* 4189 (MO, P), *Humbert* 23106 (P), *Lewis* 1253 (K, MO, P, TAN), *Malcomber* 2795 (MO), *Miller & Randrianasolo* 4667 (MO), *Humbert* 22429 (P); Massif du Tsaratanana, haut bassin de la Maevarano, crete dans le bassin superieur du ruisseau de Befosa, *Capuron* SF 24978 (P, TEF); Sambava, *Zamanivato* RN 8252 (P, TAN); Tsaratanana Nature Reserve, *Unknown Collector* RN 4719 (P, TAN). **Mahajanga:** Tsaratanana Massif, Magindrano up S ridge of Mayomokotro, *Gentry* 11575 (TAN).

33. *Gaertnera inflexa* Baill., *Adansonia* 12: 237. 1879. TYPE: Madagascar. Toamasina: S Mariam, Tafondrou, Jan. 1848, *L.-H. Boivin* 1778 (lectotype, designated here, P!; isotype, G!). Figure 8F–L.

Psychotria guillotii Hochr., *Annuaire Conserv. Jard. Bot. Genève* 11–12: 111. 1908. *Gaertnera guillotii* (Hochr.) Bremek., *Verh. Kon. Ned. Akad. Wetensch., Afd. Naturk., section 2*, 54: 148. 1963, hom. illeg., non *G. guillotii* Hochr., 1908. TYPE: Madagascar. Toamasina: Vatomandry, 2 Oct. 1908, *J. Guillot* 27 (holotype, G!; isotype, K!).

Trees, 1–6 m tall; *branches* flattened to terete, glabrous, 1.5–5.5 mm diam.; internodes 1.7–10.5 cm, smooth. *Leaf* blades 4.5–24 × 1.2–8 cm, narrowly elliptic, elliptic, or oblanceolate, apex acuminate, base acute or cuneate, drying chartaceous, glabrous; secondary veins prominulous abaxially, 7 to 13 pairs; domatia absent; petioles 4–55 mm. *Stipules* tubular, glabrous, drying chartaceous or membranous, caducous or sometimes persistent on distalmost 1 to 3 nodes, tube 2.3–4.5 mm, with ribs 4, narrowly winged, arising below or sometimes above petiole, often angling to connect in middle of interpetiolar side, then diverging and extending to lobes, apex entire, marcescent, lobes 4, 0.5–1.1 mm, deltate or filiform. *Inflorescences* cymose, several- to many-flowered, terminal on axillary and/or supra-axillary branches, pendulous, glabrous or puberulent; peduncle 1.5–6 cm; branched portion narrowly cylindrical or narrowly pyramidal, 3.5–7 × 1.1–3(–6) cm, branched to 2 to 3 orders, lax; bracts deltate to linear, 1–14 mm; bracteoles triangular to ligulate, 0.5–1 mm. *Supra-axillary branches* pendulous, up to 40 cm long, 0.8–1.4 mm diam., glabrous; leaves 2–10 × 0.3–2.5 cm, narrowly elliptic or linear, base attenuate; secondary veins 3 to 9 pairs; petiole 4–12 mm. *Flowers* 4-merous, heterodistylous, subsessile. *Long-styled flowers*: calyx cup-shaped, 1.2–1.5 mm wide, outside glabrous or puberulent, glabrous inside, truncate or lobes to 0.3 mm, triangular; corolla white, clavate in bud, when open salverform, outside glabrous, tube 3–3.5 mm, 0.9–2 mm diam., inside villous in upper third, lobes 1.5–2 mm, triangular or ligulate, acute; anthers included, filaments inserted at ca. middle of corolla tube, ca. 0.5 mm; style 2.5–3 mm, glabrous,

stigma 0.5–0.7 mm. *Short-styled flowers*: similar to long styled except calyx 1–1.5 mm wide; corolla tube 3.5–4.5 mm, 1–2.5 mm diam., inside villous at ca. middle, lobes 1.5–2.5 mm; anthers included, filaments inserted in upper third of corolla tube, 1.5–2 mm; style 0.8–1.3 mm, stigma 0.8–1.3 mm. *Drupe*s violet-black, subglobose or didymous, 6–6.5 × 5–7 mm; pyrenes spherical to hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is known from the provinces of Antsiranana and Toamasina. Here, it can be found in humid forests at elevations of 150–500 m.

Phenology. This species has been collected with flowers July through November and with fruits February through March.

Discussion. With narrowly cylindrical or pyramidal inflorescences often borne at the apex of long, pendent supra-axillary branches, *Gaertnera inflexa* is a distinctive species within Madagascar. It is similar to *G. diversifolia* of southeastern Asia, but differs from that in its bisexual 4-merous flowers. *Gaertnera inflexa* is also similar to *G. cardiocarpa*; see comments under that species.

The plants included in this species here exhibit considerable variation in length of the stipule lobes and inflorescence shape and size. Collections from the southern part of its range (e.g., *Guillot 27*, type of *Psychotria guillotii*) might be better considered a distinct subspecies or species, but these populations are provisionally included here in *Gaertnera inflexa* due to the current paucity of available collections.

Two syntypes were cited in the protologue of *Gaertnera inflexa*, *L.-H. Boivin 1778* (G!, P!) and *J. M. C. Richard 5* (Madagascar, Bay of Antongil, 1837, P!). The former is selected as lectotype here because it has a duplicate at another herbarium. The duplicate at P is chosen as the lectotype because it is deposited in the herbarium where the author of the name worked.

Representative specimens examined. MADAGASCAR. **Antsiranana:** Antalaha, *Rakotozafy 521* (TAN). **Toamasina:** Ivontaka, *Decary 111* (P); Mananara National Park, *Malcomber 2886* (MO), *2900* (MO, TEF), *2901* (MO, TEF), *Rafamantanantsoa OUEM 31* (K, MO); Mananara-Nord, *Raharimalala 1502* (P), *2151* (P); Nosy Mangabe, *Schatz 1661* (MO); Sahavolamena, Soanierana-Ivongo, *Unknown Collector SF 11060* (MO, TEF), *Capuron SF 23805* (P, TEF).

34. *Gaertnera junghuhniana* Miq., Fl. Ned. Ind. 2: 383. 1856. *Sykesia junghuhniana* (Miq.) Kuntze, Revis. Gen. Pl. 2: 425. 1891. *Gaertnera vaginans* subsp. *junghuhniana* (Miq.) Beusekom, Blumea 15: 388. 1967 [1968]. TYPE: Indonesia. Sumatra, *F. W. Junghuhn s.n.* (lectotype, designated by van Beusekom, 1967 [1968]: 385, L!; isotype,

U not seen). [SYNTYPE: *J. E. Teijsmann s.n.* (syntype, BO not seen, GH!).] Figure 6A–F.

Gaertnera zollingeriana Miq., Fl. Ned. Ind. 2: 382. 1857. *Sykesia zollingeriana* (Miq.) Kuntze, Revis. Gen. Pl. 2: 426. 1891. TYPE: Indonesia. Java, *H. Zollinger 3051* (holotype, G!; isotypes, A!, G!).

Gaertnera oxyphylla Benth., J. Proc. Linn. Soc., Bot. 1: 112. 1857, non *Gaertnera oxyphylla* Drake, 1899. *Psychotria oxyphylla* Wall., Cat. n. 8374. 1847, nom. nud. *Gaertnera koenigii* var. *oxyphylla* (Benth.) C. B. Clarke, in Hook. f., Fl. Brit. India 4: 91. 1883. *Sykesia oxyphylla* (Benth.) Kuntze, Revis. Gen. Pl. 2: 425. 1891. *Gaertnera acuminata* var. *oxyphylla* (Benth.) Ridl., Fl. Malay. Penin. 2: 428. 1923. TYPE: Singapore, *N. Wallich 8374* (holotype, K!; isotypes, BM!, K!).

Gaertnera acuminata Benth., J. Proc. Linn. Soc., Bot. 1: 112. 1857. *Sykesia acuminata* (Benth.) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Singapore, *N. Wallich 8342* (holotype, K!; isotypes, BM!, K!).

Gaertnera oxyphylla var. *angustifolia* Ridl., Fl. Malay. Penin. 2: 428. 1932. TYPE: Malaysia. Kedah: Kedah Peak, Dec. 1915, *C. B. Kloss & H. C. Robinson 5963* (holotype, SING!).

Gaertnera brevistylis Ridl., Bull. Misc. Inform. Kew 1934: 124. 1934. TYPE: Malaysia. Sabah: Sandakan, *C. V. Creagh s.n.* (holotype, K!; isotype, K!).

Gaertnera taiensis Kerr, Bull. Misc. Inform. Kew 1940: 180. 1940. TYPE: Thailand. Trang: Kao Soi Dao, 300 m, *A. Kerr 19137* (holotype, K!; isotypes, BM!, L!).

Trees or shrubs, 1–10(–15) m tall; *branches* terete to flattened or quadrangular, glabrous to puberulent, 1–6 mm diam.; internodes (0.5–)1.3–7(–10) cm, smooth. *Leaf* blades 3–24 × (0.7–)1–9.5 cm, lanceolate to narrowly lanceolate, elliptic-oblong, elliptic, or oblanceolate, apex acuminate or cuspidate, base cuneate to acute (rounded), drying chartaceous, adaxially glabrous, abaxially glabrous to puberulent or pilosulose on principal veins with indumentum drying gray-white; secondary veins prominulous abaxially, 3 to 9(to 11) pairs; domatia absent or present; petioles 2–25 mm. *Stipules* tubular, glabrous to puberulent, drying chartaceous, caducous or fragmenting, tube (3–)8–23 mm, with ribs none or 4, narrowly to broadly winged, arising below petiole and sometimes extending to lobes, apex entire or with 1 or 2 incisions, marcescent, lobes 4, 1.5–7 mm long, deltate. *Inflorescences* cymose, several- to many-flowered, terminal on axillary branches, glabrous to densely puberulent or pilosulose, sessile or peduncle to 6.5 cm; branched portion corymbiform to pyramidal, 1.5–15(–18) × 1.5–17(–22) cm, lax, branched to 2 to 6 orders; bracts deltate or trifid, 3–10 mm; bracteoles reduced; pedicels absent or to 3.5 mm. *Flowers* 5-merous, unisexual. *Pistillate flowers*: calyx cup-shaped, 2–3 mm wide, outside glabrous or puberulent, with hair-ring inside, truncate or lobes to 0.4(–0.7) mm, triangular; corolla pale green or

white, clavate in bud, when open salverform, outside glabrous or puberulent, tube 2.5–5 mm, 1.5–2.2 mm diam., inside villous in upper third, lobes 1.5–3 mm, triangular to ligulate, acute; staminodia included, filaments inserted in upper third of corolla tube, ca. 0.2 mm; style 3–6 mm, glabrous, stigma 2–2.5 mm. *Staminate flowers*: similar to pistillate except corolla tube 2–5 mm, 1.8–2.5 mm diam.; anthers shortly exerted, filaments 0.5–2 mm long; pistillode with style portion absent or ca. 1 mm, glabrous, stigma absent or ca. 0.5 mm. *Drupe*s violet-black, didymous or globose, 5–7 × 5–8 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in southeastern Asia, where it is known from Thailand, Peninsular Malaysia, Sumatra (part of Indonesia), Borneo in the Brunei, Kalimantan (Indonesia), and Sarawak (Malaysia) sectors, and Sulawesi (part of Indonesia). Here, it is found in humid forests at elevations of 0–1500 m.

Phenology. This species has been collected with flowers and fruits throughout the year.

Discussion. This species belongs to the *Gaertnera vaginans* complex; see also the discussion of that group for related species and their distinctions. This species was included by van Beusekom (1967) in his broad circumscription of *G. vaginans*, as *G. vaginans* subsp. *junghuhniana*, but these species are considered separate here as discussed in the introduction. Some specimens included by him in *G. vaginans* subsp. *junghuhniana* are treated here in *G. alstonii*, *G. aphanodioica*, *G. belumutensis*, *G. capitulata*, *G. kochummenii*, *G. ramosa*, and *G. sralensis*. *Gaertnera junghuhniana* as circumscribed here can be distinguished by its tubular stipules that dry chartaceous and closely surround the stem, its several- to many-flowered cymes, and its pale green or white flowers with either a well-developed androecium and relictual gynoecium (staminate) or well-developed gynoecium and relictual androecium (pistillate).

Representative specimens examined. BRUNEI [DARUS-SALAM]. **Belait**: Badas Reserve, *Malcomber* 3001 (MO), 3002 (MO), 3003 (MO), 3004 (MO), 3005 (MO), 3006 (MO). **Brunei-Muara**: Rimba Kumpul Meragang, *Suhaili Hj. Zinin BRUN* 15022 (SAN). **Temburong**: Wong Ngaun Gorge, *Wong* 1724 (A, BRUN, KEP, L, SAR, SAN, SING). INDONESIA. **Borneo**. Kalimantan: Sg. Sebakis, Bulungan, *Kostermans* 9252 (K, L, SING). Kalimantan Timur [East Kalimantan]: Wanariset-Handil II, *Van Balgooy* 6062 (K); Malili, Larona, 2°40'S, 121°10'E, *Meijer* 11241 (L). **Celebes**. Sulawesi: betw. Soroaka & Wawondula, *Van Balgooy* 4052 (A, K, L). **Sumatra**. Aceh: Asahan, Poelock, *Rahmat Si Boeea* 5722 (A, G, K, L). Bangka: Lobok-besar, *Kostermans* 238 (A, BM, K, KEP, L, SING). Riau: Bukit

Karampal, 0°46'S, 102°32'E, 100 m, *Burley* 1157 (A, E, K, KEP, L, SING). Riouw [Riau] Archipelago: Batang Belobang, 40 m, *Bünnemeyer* 7686 (L). **Selantin [South Sumatra]**: Palembang, Bigin Telok, *Forbes* 3214 (BM, K, L, SING, WU). MALAYSIA. **Sabah**: Sandakan, Sepilok Reserve 5, *Nawas A.* 834 (A, K, KEP, SING). **Sarawak**: Bako Park, *Ashton* 17970 (K, L, SAR), *Malcomber* 2028 (MO); Lambir Park, *Rena George S.* 40507 (E, K, KEP, L, SAN, SAR). **Selangor**: Ulu Gombak Reserve, *Kochummen FRI* 32515 (A, K, KEP, L, SAN). **Terengganu**: Bukit Bauk, *Malcomber* 2027 (MO). THAILAND. **Trang**: Kao Soi Dao, *Kerr* 19137 (K, L).

35. *Gaertnera kochummenii* Malcomber, sp. nov.

TYPE: Malaysia. Terengganu: 10th Mile, Dunguan–Bukit Besi Rd., Compt. 12, Bukit Bauak Forest Reserve, 4°46'N, 103°10'E, 18 June 1967, *K. M. Kochummen FRI* 2387 (holotype, KEP!; isotype, L!).

Haec species *Gaertnerae junghuhnianae* Miq. similis, sed ab ea planta in sicco aurantiaca, inflorescentia congesta capituliformi atque lobulis calycinis bene evolutis usque ad 3.5 mm longis distinguitur.

Shrubs, to 1 m tall; plants drying with orange cast; branches terete, when young puberulent with indumentum drying brown, becoming glabrescent, 2–3 mm diam.; internodes 3.2–7 cm, smooth. *Leaf* blades 6.5–17 × 1.5–5 cm, (narrowly) elliptic, apex acuminate, base attenuate, drying chartaceous, adaxially glabrous, abaxially puberulent with indumentum drying reddish to orange; secondary veins distinct abaxially, 7 to 9 pairs; domatia absent; petioles 3–5 mm. *Stipules* tubular, puberulent, drying chartaceous, tube 6–12 mm, with ribs 4, narrowly winged, arising below petiole and extending to lobes; apex with 2 incisions, marcescent, lobes 4, ca. 5 mm, deltate to linear. *Inflorescences* congested-cymose, many-flowered, terminal on axillary branches, pilosulose, sessile, subglobose, 1.5–2.5 × 2–3 cm, congested, branched to 1 to 2 orders; bracts deltate, 0.5–2 mm, sometimes glabrous; bracteoles reduced; pedicels absent or to 2 mm. *Flowers* 5-merous, floral biology unknown. *Calyx* campanulate, 2.5–3.5 mm wide, outside puberulent or pubescent, glabrous inside, lobes 1–3.5 mm, ovate; corolla, stamens, and stigmas unknown. *Immature drupes* globose or subglobose, 5–7 × 5–7 mm.

Distribution and habitat. This species grows in southeastern Asia, where it has been found in Peninsular Malaysia. The habitat and elevations where it grows have not been recorded.

Phenology. This species has been collected with flower buds in June; it has not been collected with mature flowers or fruits.

Discussion. This is a poorly known but distinctive species. *Gaertnera kochummenii* can be recognized by

the distinctive orange color of dried specimens; its pubescent branches, leaves, and stipules; its congested subglobose inflorescence; and its well-developed calyx lobes. The mature flowers and fruits are unknown. This species is named in honor of K. M. Kochummen (1931–1999), who collected the type specimen and produced many important contributions to Malesian botany. This species belongs to the *G. vaginans* complex; see also the discussion of that group for related species and their distinctions.

36. *Gaertnera letouzeyi* Malcomber, sp. nov.
TYPE: Cameroon. Betw. Tabo & Akoumayip River, 20 km W of Mamfe, 2 June 1975, *R. Letouzey* 13702 (holotype, MO!; isotypes, BR!, K!, MO!, P!, WAG!).

Haec species *Gaertnerae paniculatae* Benth. similis, sed ab ea foliis oblongo-ovatis atque stipulis manifeste quadrangularibus apice semel fissis in quoque latere tubi ac sub petiolo alis duabus longitudinalibus prominentibus munitis distinguitur.

Shrubs, 4–5 m tall; *branches* flattened near stem apex, otherwise terete to subquadrangular, when young branches glabrous or puberulent with indumentum drying yellow, becoming glabrescent, 5–9 mm diam.; internodes 4.5–16 cm, smooth. *Leaf* blades 16–33 × 7.5–13.5 cm, elliptic-oblong to ovate, apex rounded then abruptly shortly cuspidate or acuminate, base cuneate or obtuse, drying coriaceous or chartaceous, glabrous; secondary veins prominulous abaxially, 7 to 12 pairs; domatia absent; petioles 10–45 mm. *Stipules* tubular, glabrous or puberulent, drying chartaceous, persistent on distalmost nodes or fragmenting, tube 30–45 mm, with ribs 4, narrowly winged, arising below petiole and extending to lobes, apex with 1 incision, lobes 2, 1–7 mm, deltate. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches, densely pilosulose to glabrous; peduncle 2.5–13.5 cm; branched portion corymbiform, 7–23 × 6.5–22 cm, branched to 3 to 5 orders, lax; bracts deltate or trifid, 3–10 mm; bracteoles reduced; pedicels absent or up to 3.5 mm. *Flowers* 5-merous, floral biology unknown. *Calyx* cup-shaped, 2.5–3.5 mm wide, pale pinkish green, outside glabrous or puberulent, with hair-ring inside, lobes 0.3–2 mm, triangular to oblong or rounded; corolla in bud white, clavate and densely puberulent outside with tube to 5 mm and lobes to 3 mm, mature corollas, stamens, and stigmas unknown. *Drupe*s violet-black, globose or subglobose or didymous, 6–9 × 6–9 mm; pyrenes spherical or hemispherical, rugose, finely fissured or with pale brown striations, endosperm entire.

Distribution and habitat. This species grows in Central Africa, where it has been found in Cameroon.

Here, it is found in lowland humid forests, but the elevation where it grows has not been noted.

Phenology. This species has been collected with flowers in May and June and with fruits in July.

Discussion. *Gaertnera letouzeyi* is similar to *G. lowryi* of Madagascar, but differs in its elliptic-oblong to ovate leaves with seven to 12 pairs of secondary veins and its pale pinkish green calyx tubes. This species is named in honor of the botanist René Letouzey (1918–1989), who collected the type specimen in addition to numerous other notable plants from Cameroon.

Paratypes. CAMEROON. Akwaya-Mamfe rd., betw. Nyang & Mabeme river, 20 km NNE of Mamfe, 31 July 1975, *Letouzey* 14153 (P); Korup National Park, *Kenfack* 763 (MO).

37. *Gaertnera leucothyrsa* (K. Krause) E. M. A. Petit, Bull. Jard. Bot. État Bruxelles 32: 186. 1962. Basionym: *Psychotria leucothyrsa* K. Krause, Bot. Jahrb. Syst. 57: 47. 1920. TYPE: Belgian Congo [Democratic Republic of the Congo]. Orientale: Betw. Yangambi & Pata-bongo, May 1908, *G. W. J. Mildbraed* 3287 (lectotype, designated by Petit, 1962: 186, HBG not seen; isotypes, B†, HB not seen). [SYNTYPE: *G. W. J. Mildbraed* 3206 (B†).]

Gaertnera parvipaniculata E. M. A. Petit, Bull. Jard. Bot. État Bruxelles 29: 52. 1959. TYPE: Belgian Congo [Democratic Republic of the Congo]. Orientale: Yangambi, ca. 470 m, 25 June 1938, *J. Louis* 9979 (holotype, BR!).

Trees or shrubs, 0.8–2.5 m tall; *branches* terete, glabrous, 1.5–5 mm diam.; internodes 0.4–6.5 cm, smooth. *Leaf* blades 3.2–17 × 1.3–5.5 cm, elliptic to oblanceolate or obovate, apex cuspidate or acuminate, base attenuate or cuneate, drying chartaceous, glabrous; secondary veins prominulous abaxially, 4 to 7 pairs; domatia absent; petioles 5–10 mm. *Stipules* tubular, glabrous, drying membranous, caducous, tube 10–30 mm, with ribs 4, narrowly winged, arising below petiole and sometimes extending to lobes, apex with 1 incision, marcescent, lobes 4, 1–4 mm, linear to filiform. *Inflorescences* cymose, several- to many-flowered, on principal and/or axillary branches, pilosulose or puberulent, sessile or peduncle to 4 cm; branched portion subglobose or corymbiform 0.9–5 × 1–4 cm, branched to 1 to 4 orders, congested; bracts linear to lanceolate, 1–6.5 mm, glabrous; bracteoles reduced; pedicels absent or to 1.5 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 1.5–3 mm wide, glabrous or puberulent outside, with hair-ring inside, lobes 1–4 mm, linear to triangular or lanceolate; corolla white, clavate in bud, when open infundibu-

liform or salverform, outside glabrous, tube 3.5–5.5 mm, 1.5–2.5 mm diam., inside villous in upper third, lobes 2.5–4 mm, lanceolate or linear, obtuse or rounded; anthers included, filaments inserted in upper third of corolla tube, ca. 0.3 mm; style 4.5–5.5 mm, glabrous below and pubescent near apex, stigmas 0.5–1.2 mm. *Short-styled flowers*: similar to long styled except corolla tube 4–5 mm, 2.2–2.6 mm diam., lobes 3–4 mm, ligulate or ovate-oblong, acute; anthers fully exerted, filaments 1.5–2.5 mm; style 2.8–3.2 mm, glabrous, stigmas 1–1.4 mm. *Drupe*s violet-black, globose or subglobose, 6–10 × 6–10 mm; pyrenes spherical or hemispherical, smooth, endosperm entire.

Distribution and habitat. This species grows in Central Africa, where it has been collected in the Democratic Republic of the Congo and Gabon. Here, it is found in humid forests at elevations of 470–1150 m.

Phenology. This species has been collected with flowers June through October and with fruits January through April and July through December.

Discussion. *Gaertnera leucothyrsa* is similar to and may be confused with *G. bieleri* in Central Africa, but *G. leucothyrsa* differs from that species in its glabrous stems and stipules and its caducous stipules with one incision. *Gaertnera leucothyrsa* is also similar in general aspect to *G. longivaginalis* var. *bracteata*; see comments under that species.

As noted by Petit (1959b), the stipules of this species are distinctive but rarely observed on herbarium collections. Petit described *Gaertnera parvipaniculata* in his review of African *Gaertnera* (1959a) and then discovered an older name for this species during a review of African *Psychotria* (Petit, 1962). He selected as lectotype the only specimen he located of Krause's original materials.

Additional specimens examined. DEMOCRATIC REPUBLIC OF THE CONGO. Befale, Ifale River, *Evrard* 2893 (BR, P, WAG); Epulu, Mambasa, Ituri Forest, *Hart* 319 (BR), *Liengola* 157 (WAG); Iwama (Monkoto Territory), *Evrard* 2827 (BR, K, WAG); Kole (Sankuru), *Lebrun* 6332 (BR, K), 6414 (BR, FHO); Okoka Village (Lodja-Sankuru Territory), *Germain* 7551 (BR); Yangambi, *J. Louis* 2252 (BR), 2305 (BM, BR), 11211 (BR, MO), 11586 (BR). GABON. Ngoumié: Chaillu Massif, *A. M. Louis et al.* 909 (K, WAG).

38. *Gaertnera liberiensis* E. M. A. Petit, Bull. Jard. Bot. État Bruxelles 29: 40. 1959, nom. nov. *Gaertnera salicifolia* Hutch. & Gillett, Fl. W. Trop. Afr. 2: 21. 1931, hom. illeg., non *Gaertnera salicifolia* C. H. Wright ex Baker, 1903. TYPE: Liberia. Monrovia, Dukwai River, 1928, *G. P. Cooper* 277 (holotype, K!; isotypes, A!, BM!, FHO!).

Trees, up to 7 m tall; bark smooth; *branches* terete, puberulent with indumentum drying yellow or gray-white, 1–2 mm diam.; internodes 2.5–5.2 cm, smooth. *Leaf* blades 6–12 × 1.5–3 cm, elliptic to oblong or lanceolate, apex acuminate, base cuneate, drying chartaceous, adaxially glabrous, abaxially glabrous except pubescent on principal veins with indumentum drying reddish brown to brown; secondary veins distinct abaxially, 4 to 7 pairs; domatia present; petioles 2–8 mm. *Stipules* tubular, pubescent, drying chartaceous, caducous, tube 7–10 mm, with ribs 4, narrowly winged, arising beneath petiole and extending to the apex, apex entire, marcescent, lobes 4, ca. 9 mm, linear to filiform, setae numerous, 1–9 mm. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches, puberulent; peduncle 2–3.5 cm; branched portion narrowly pyramidal, 1.8–5 × 1.2–3 cm, lax to congested, branched to 3 or 4 orders; bracts deltate or trifid, 3–8 mm, sometimes glabrous; bracteoles reduced; pedicels absent or to 0.5 mm. *Flowers* 5-merous, presumably heterodistylous. *Calyx* cup-shaped, 1–2 mm wide, outside puberulent, glabrous inside, truncate or lobes to 0.3 mm, triangular; corolla in bud white, clavate and glabrous outside, mature corollas, stamens, and stigmas unknown. *Drupe*s unknown.

Distribution and habitat. This species grows in West Africa, where it has been collected in Liberia. The habitat and elevations where it grows have not been recorded.

Phenology. This species has been collected with flowers, but the collection months have not been recorded; it has not been collected with fruits.

Discussion. *Gaertnera liberiensis* is so far only known from the type specimen. It is similar to *G. eketensis*, but *G. liberiensis* lacks the diagnostic longitudinally striated or fissured bark of *G. eketensis* and has pubescent rather than glabrous stipules and a pyramidal rather than corymbiform inflorescence. Although Hutchinson and Gillett later provided a Latin diagnosis for their name *G. salicifolia* (Bull. Misc. Inform. Kew 1937: 62), this name was validly published in their 1931 work with an English diagnosis; the ICBN requirement (McNeil et al., 2006) for a Latin diagnosis only applies to names published during or after 1935.

39. *Gaertnera longifolia* Bojer, Hortus Maurit. 216. 1837. *Sykesia longifolia* (Bojer) Kuntze, Revis. Gen. Pl. 1: 425. 1891. TYPE: Mauritius. Nouvelle Découverte and Quartier Militaire, W. Bojer s.n. (holotype, P not located; isotype, W!).

Gaertnera longifolia var. *pubescens* Verdc., Kew Bull. 37: 542. 1983, syn. nov. TYPE: Mauritius. Nouvelle Découverte and Forêts de Grand Bassin, L. S. Bouton s.n. (holotype, K!).

Trees, 1.5–3 m tall; *branches* terete to quadrangular, when young glabrous or puberulent with indumentum drying yellow, becoming glabrescent, 8–9 mm diam.; internodes 0.7–2 cm, smooth. *Leaf* blades 12.5–42 × 3.5–11.5 cm, elliptic to elliptic-oblong or oblanceolate, apex shortly acuminate or acute, base cuneate, drying coriaceous, adaxially glabrous, abaxially glabrous or puberulent with indumentum drying brown or yellow; secondary veins prominulous abaxially, 8 to 16(to 20) pairs; domatia absent; petioles 20–40 mm. *Stipules* calyptrate, puberulent or glabrous, drying chartaceous, caducous, tube 20–25 mm, with ribs 4, broadly winged, arising below petiole and extending to lobes, apex with 2 incisions, marcescent, lobes 2, 2–3 mm, deltate to linear. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches, glabrous to densely puberulent; peduncle 1–4 cm; branched portion corymbiform, 8–10 × 12–13.5 cm, branched to 4 to 5 orders, lax; bracts deltate or trifid, 3–12 mm; bracteoles triangular to ovate, 1–2 mm; pedicels 1.5–3 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 3–4 mm wide, outside glabrous or puberulent, with hair-ring inside, truncate or lobes to 0.5 mm, rounded; corolla white, clavate in bud, when open salverform, glabrous throughout, tube 17–18 mm, 3–4 mm diam., lobes 8–9 mm, elliptic-oblong, obtuse; anthers included, filaments inserted in upper third of corolla tube, 0.5–1 mm; style 18–19 mm, glabrous or often pubescent in upper part, stigma ca. 1.5 mm. *Short-styled flowers*: mature corolla, stamens, and stigmas not seen. *Drupe*s whitened to blue, obovoid to ellipsoid, 23–28 × 12–16 mm, ribbed; pyrenes plano-convex, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Mauritius, where it can be found in wet forests and lower montane forests at elevations of 500–700 m.

Phenology. This species has been collected with flowers in June and December and with fruits in May.

Discussion. *Gaertnera longifolia* is a distinctive species with relatively large, elliptic-oblong or oblanceolate leaves that dry coriaceous and relatively large, obovoid to ellipsoid fruits. The label data of *Lorence 2224* note a “slight” fragrance. Verdcourt (1983) separated the pubescent-leaved plants as *G. longifolia* var. *pubescens* Verdc. This variety was only known from an early 19th-century Bojer collection and was considered extinct until Page and D’Argent rediscovered three individual trees growing in an area

in Black River Gorges National Park dominated by invasive species (Anonymous, 1997). These varieties are not separated here; the variation in pubescence is the only character that distinguished them, and this feature seems to show continuous variation rather than separating two distinct populations.

Representative specimens examined. MAURITIUS. Perrier Nature Reserve, *Lorence 2224* (MO), *Vaughan MAU 10387* (MAU), *Vaughan MAU 14123* (MAU); Black River Gorges National Park, *Malcomber 2935* (MO), *Page MAU 22729* (MAU).

40. *Gaertnera longivaginalis* (Schweinf. ex Hiern) E. M. A. Petit, Bull. Jard. Bot. État Bruxelles 29: 45. 1959, as “*longevaginalis*.” Basionym: *Psychotria longivaginalis* Schweinf. ex Hiern, Fl. Trop. Afr. 3: 201. 1877, as “*longevaginalis*.” TYPE: Belgian Congo [Democratic Republic of the Congo]. Forestier Central Distr. [Équateur?]: Kapili River, Apr. 1870, *G. A. Schweinfurth 3552* (holotype, K!; isotypes, BM!, P!).

Trees or shrubs, 1–6(–8) m tall; *branches* terete, glabrous to puberulent, 2–3(–6) mm diam.; internodes 1.5–6.5 cm, smooth. *Leaf* blades (3–)5.5–18.5 × (0.7–)2.3–8 cm, elliptic to oblanceolate, elliptic-oblong, or oblong, apex cuspidate or acuminate, base acute to obtuse, drying chartaceous, adaxially glabrous, abaxially glabrous or sparsely hirtellous on principal veins; secondary veins prominulous abaxially, 5 to 8 pairs; domatia absent or present; petioles 5–15 mm. *Stipules* tubular, glabrous to puberulent or pilosulose, drying membranous, caducous or with persistent base 1–2 mm, tube 8–28 mm, with ribs absent or 3 or 4, narrowly winged, arising above to below petiole and sometimes extending to lobes, apex entire or with 1 incision, marcescent, lobes 4, 1–8 mm, deltate to filiform. *Inflorescences* cymose, several- to many-flowered, terminal on principal and/or axillary branches, puberulent to pilosulose or hirtellous, sessile or peduncle to 6.5 cm; branched portion corymbiform, 1–10 × 1.2–15 cm, lax to congested, branched to 3 or 4 orders; bracts deltate or trifid, 3–18 mm, entire or ciliate; bracteoles 0.5–2 mm; pedicels absent or to 1 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 2–3.5 mm wide, glabrous outside, with hair-ring inside, lobes 0.2–4.5 mm, triangular to lanceolate; corolla white, clavate in bud, when open infundibuliform or salverform, outside glabrous, tube 4–6 mm, 1–3.5 mm diam., inside villous in upper third; lobes 2.5–5 mm, linear to ligulate; anthers shortly exserted, filaments inserted in upper third of corolla tube, ca. 0.5 mm; style 5–7 mm, glabrous or pubescent in upper portion, stigmas 0.8–2 mm. *Short-styled flowers*: similar to long styled except calyx 1–

3.5 mm wide, lobes 0.5–2.9 mm, triangular to lanceolate; corolla tube 1–4 mm diam., lobes 3–5 mm, triangular to ligulate or ovate-oblong; anthers fully exerted, filaments 3–6 mm; style 3.5–5 mm, stigmas 0.5–2 mm. *Drupes* violet-black, globose to subglobose or didymous, 5–10 × 5–12 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in West and Central Africa, where it is known from Angola, Cameroon, the Democratic Republic of the Congo, the Republic of the Congo, Gabon, Guinea, Côte d'Ivoire, Liberia, and Sierra Leone. Here, it is found in humid forests at elevations of 150–1600 m.

Phenology. This species has been collected with flowers and fruits throughout the year.

Discussion. This species belongs to the *Gaertnera vaginans* complex; see also the discussion of that group for related species and their distinctions. This name was originally published as “*longevaginalis*,” but the ICBN mandates a spelling correction for this variant (McNeil et al., 2006). Van Beusekom (1967) included *G. longivaginalis* in *G. vaginans* subsp. *vaginans*, but that is circumscribed more narrowly here; consequently, several taxa included by van Beusekom are separated here. *Gaertnera longivaginalis* differs from *G. vaginans* in its tubular stipules that dry membranous, closely envelop the stem, and have prominent filiform lobes at the apex.

Petit (1959a) recognized *Gaertnera longivaginalis* and *G. bracteata* as separate species, but with more specimens available now, these are not completely distinct morphologically and are treated here as varieties. These differ morphologically as outlined in the key below and also in elevational and geographic ranges, with variety *longivaginalis* documented widely from West through Central Africa at 150–1000 m versus variety *bracteata* documented from West Africa through the Republic of the Congo at 1100–1600 m.

- 1a. Calyx with tube 1–1.75 mm long, lobes 1.2–4.5 mm long; inflorescence bracts deltate to usually linear-lanceolate 40a. variety *bracteata*
1b. Calyx with tube 1.5–2.5 mm long, truncate or with lobes to 1 mm long; inflorescence bracts deltate to usually elliptic 40b. variety *longivaginalis*

40a. *Gaertnera longivaginalis* var. *bracteata* (E. M. A. Petit) Malcomber, comb. et stat. nov.
Basionym: *Gaertnera bracteata* E. M. A. Petit, Bull. Jard. Bot. État Bruxelles 29: 49. 1959. TYPE: Congo [Republic of the Congo]. Kasai Distr.: Butala, Nov. 1903, *E. Laurent & M. Laurent s.n.* (holotype, P!).

Gaertnera bracteata var. *glabrifolia* E. M. A. Petit, Bull. Jard. Bot. État Bruxelles 29: 50. 1959, syn. nov. TYPE: Belgian Congo [Democratic Republic of the Congo]: Distr. Forestier Central [Equateur], Ilenge, Nov. 1921, *V. G. Goossens 2688* (holotype, BR!; isotypes, G!, P!).

Trees, 1–4 m tall; *branches* 2–3 mm diam. *Leaf* blades 3–15 × 0.7–6 cm, elliptic to elliptic-oblong; petioles 5–10 mm. *Stipules* with tube 8–24 mm, with ribs none or 4, lobes 3–8 mm, filiform to narrowly triangular. *Inflorescences* densely pilosulose to hirtellous; peduncle 1–6 cm; branched portion 1.2–15 cm wide; bracts deltate to linear-lanceolate, 3–18 mm, ciliolate; pedicels absent or to 0.3 mm. *Long-styled flowers*: calyx 2–3 mm wide, with tubular part 1–1.75 mm, lobes 1.2–4.5 mm, triangular to lanceolate; corolla tube 4–5 mm, 1–2.5 mm diam; lobes 3–5 mm, linear to ligular or elliptic-oblong. *Short-styled flowers*: similar to long styled except calyx 1–2.5 mm wide, lobes 1.2–2.9 mm; corolla tube 4–6 mm; filaments 4–6 mm; style 4–5 mm, stigmas 0.5–1 mm. *Drupes* 5–10 × 5–12 mm.

Distribution and habitat. This variety grows in Central and West Africa, where it has been found in the Democratic Republic of the Congo, the Republic of the Congo, Guinea, Côte d'Ivoire, Liberia, and Sierra Leone. Here, it can be found in humid forests at elevations of 1100–1600 m.

Phenology. This variety has been collected with flowers and fruits throughout the year.

Discussion. *Gaertnera longivaginalis* var. *bracteata* has been confused with *G. cooperi*, and some specimens cited in the original description of that species are not conspecific with its type and are included here (Petit, 1959a). This variety is similar to *G. bieleri* and *G. leucothyrsa*; those can be distinguished by the well-developed stipular ridges or wings that surround the base of the petiole, and *G. bieleri* additionally by its pilosulose to hirtellous stems and stipules.

Petit (1959a) separated *Gaertnera bracteata* var. *glabrifolia* E. M. A. Petit based on its abaxial leaf surfaces completely glabrous rather than sparsely hirtellous along the principal veins. However, the criteria applied in this current revision for distinguishing taxa are different, and here this variation in pubescence is considered to be a character that varies among local populations or among individual plants, and thus is not indicative of distinct, separately evolving evolutionary lineages. Accordingly, this variety is not considered to describe a distinct taxonomic lineage and is synonymized here.

Representative specimens examined. DEMOCRATIC REPUBLIC OF THE CONGO. Ligasa, Lokombe River (T. Isangi), *Germain 8501* (BR). GUINEA [GUINEA-CONAKRY]. Crête, *Adam 28771* (MO, WAG); Mt. Nimba, *Adam*

4697 (P). IVORY COAST [CÔTE D'IVOIRE]. Mt. Nimba, *Gautier-Beguin & Gautier-Beguin 1263* (G, MO); Tonkoui Massif, *Hallé 380* (P). LIBERIA. Bomi Hills, *Jansen 1515* (K, MO, WAG); Nimba, *Breteler 5458* (MO, P, WAG). REPUBLIC OF THE CONGO. Alima-Likouala Basin, Fort Rousset, *Descoings 8539* (P, WAG). SIERRA LEONE. Mt. Loma, *Jaeger 7158* (K, MO, P, WAG); Nongowa, Kambui Hills, *Bakshi 184* (K, P).

40b. *Gaertnera longivaginalis* (Schweinf. ex Hiern) E. M. A. Petit var. ***longivaginalis***.

Gaertnera plagiocalyx K. Schum. ex Thonn. & H. Durand, Syll. Fl. Congol. 373. 1909. [Westafr. Kautschuk-Exped. 322. 1900, nom. nud.]. TYPE: Belgian Congo [Democratic Republic of the Congo]. Kinshasa: Leopoldville [Kinshasa], Stanley Pool, June 1899, *R. Schlechter 12586* ([holotype, B†]; lectotype, designated here, BM!; isotypes, BR!, G!, K!, L!, P!).

Gaertnera longivaginalis var. *louisii* E. M. A. Petit, Bull. Jard. Bot. État Bruxelles 29: 48. 1959, syn. nov. TYPE: Belgian Congo [Democratic Republic of the Congo]. Distr. Forestier Central, Orientale, Yangambi et environs, ca. 460 m, *J. Louis 12577* (holotype, BR!).

Trees or shrubs, 1–6(–8) m tall; *branches* 2–3(–6) mm diam. *Leaf* blades (3–)5.5–18.5 × (0.8–)2.3–8 cm, elliptic to elliptic-oblong or oblanceolate; petioles 10–15 mm. *Stipules* with tube 10–28 mm, with ribs 3 or 4, lobes 1–5.5 mm, deltate to filiform. *Inflorescences* densely puberulent to pilosulose, sessile or peduncle to 6.5 cm; branched portion 1.5–15 cm wide; bracts elliptic to deltate, 3–10 mm, entire; pedicels absent or to 1 mm. *Long-styled flowers*: calyx 2–3.5 mm wide, lobes 0.1–1 mm, triangular to broadly triangular; corolla tube 4–6 mm, 1.5–3.5 mm diam.; lobes 2.5–3.5 mm, ligulate. *Short-styled flowers*: similar to long styled except calyx lobes 0.5–1 mm; corolla tube 4–5.5 mm, 1.4–4 mm diam.; filaments 3–3.5 mm; style 3.5–4.5 mm, stigmas 1.5–2 mm. *Drupe*s 5–8 × 5–8 mm.

Distribution and habitat. This variety grows in West and Central Africa, Angola, Cameroon, the Democratic Republic of the Congo, the Republic of the Congo, Gabon, Guinea, Côte d'Ivoire, Liberia, and Sierra Leone. Here, it can be found in humid forests at elevations of 150–1000 m.

Phenology. This species has been collected with flowers and fruits throughout the year.

Discussion. Petit (1959a) separated *Gaertnera longivaginalis* var. *louisii* based on its inflorescence with the branched portion 1–6 cm long with two or three pairs of secondary axes and its abaxial leaf surfaces sparsely pubescent along the principal veins or less often glabrous, versus inflorescences with the branched portion 1.5–9 cm long with two to five pairs of secondary axes and the abaxial leaf surfaces glabrous or less often pubescent along the costa.

The conditions that characterized each of Petit's variety are thus similar and do not separate two clearly distinguishable groups of plants. Thus, the criteria applied in this current revision to distinguish taxa, the clear separation of distinct groups, are not met and so this variety is not recognized here and is synonymized accordingly.

The holotype of *Gaertnera plagiocalyx* was destroyed with the general Rubiaceae collection in the Berlin herbarium; the isotype at BM is selected as the lectotype here because it has a digital image available on the Aluka web site and is the best representative of this species among the digitally imaged isotypes there.

Representative specimens examined. ANGOLA. Rio Luachimo, near Vila Henrique de Carvalho, *Exell 708* (BM). CAMEROON. Awout River, 42 km SE of Mbalmayo, *Asonganyi 34* (BR, P); Dja, betw. Meu & Edjune rivers, *Letouzey 3780* (MO, P, WAG); M'Balmayo, ca. 50 km S of Yaoundé, *Mpom 334* (BR, P); Membe & Guervoum, *Letouzey 2116* (BR, MO, P). DEMOCRATIC REPUBLIC OF THE CONGO. Api, *Robyns 1237* (BR, FHO, G); Eala, *Corbisier 1120* (BM, BR, FHO); Imbonga (Territory Ingende), *Evrard 6083* (BR, FHO); Léopoldville, *Goossens 6197* (BR, FHO); Liaka (Basankusu Territory), Yangambi, Tutuku Island, Isalowe Plateau, *Louis 9169* (BR, K, MO). GABON. **Ogooué-Ivindo:** Ivindo River, L bank, 11 km SSW of Makokou, *Leeuwenberg 11508* (BR, K, MO, P); Lope Reserve, bank of Ogooué River, *J. de Wilde 11449* (WAG). **Ogooué-Lolo:** Lastoursville, *Le Testu 7622* (BM, BR, MO, P). GUINEA [GUINEA-CONAKRY]. Nzo-Nimba, *Adam 27518* (BR, MO, WAG). IVORY COAST [CÔTE D'IVOIRE]. Mont Tonkoui, *Bamps 2263* (BR, P). LIBERIA. Mt. Wolagisi, near Pandamai, *Bequaert 106* (K). REPUBLIC OF THE CONGO. Alima-Likouala Basin, Fort Rousset, *Descoings 8282* (P, WAG), *8664* (WAG); Brazzaville, *Chevalier 27743* (P), *Harder 3751* (MO). SIERRA LEONE. Mt. Loma, *Jaeger 1166* (MO, P, WAG).

41. *Gaertnera lowryi* Malcomber, sp. nov. TYPE: Madagascar. Toamasina: Masoala National Park, West Coast, near Antalavia, 0.8 km NE of village, lowland forest beside Antalavia River, 15°47'S, 50°02'E, 50–150 m, 12 Oct. 1997, *S. T. Malcomber 2827* (holotype, MO!; isotypes, BR!, G!, K!, P!, PRE!, TEF!, WAG!). Figure 7C–H.

Haec species *Gaertnerae vaginanti* (DC.) Merr. similis, sed ab ea foliorum anguste ellipticorum vel oblanceolatorum venis secundariis 13- ad 18-jugatis atque stipulis manifeste quadrangularibus apice semel fissis in quoque latere tubi ac sub petiolo alis duabus prominentibus munitis distinguitur.

Trees, 2–8 m tall; *branches* ± tetragonal, glabrous, 4–8 mm diam.; internodes 5.8–12.5 cm, smooth. *Leaf* blades 29–40 × 5.3–8.4 cm, elliptic or oblanceolate, apex acuminate or acute, base cuneate to rounded, drying coriaceous, glabrous; secondary veins prominent abaxially, 13 to 18 pairs; domatia absent; petioles 5–30 mm. *Stipules* tubular, glabrous, drying chartaceous, deciduous after distalmost 1 to 3 nodes,

often by fragmentation, tube 29–80 mm, with ribs 4, broadly winged, arising below petiole and extending to lobes, apex with 1 deep incision, marcescent, lobes 4, 4–10 mm, deltate. *Inflorescence* cymose, many-flowered, terminal on axillary branches, pendulous, densely puberulent; peduncle 5–16 cm; branched portion corymbiform or broadly pyramidal, 9–21 × 6–17 cm, branched to 3 to 4 orders, lax to congested; bracts deltate or linear to ligulate, 2.3–18 mm; bracteoles triangular to ligulate or lanceolate, 0.5–2 mm; pedicels absent or to 2.5 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 2–3 mm wide, outside glabrous or puberulent, glabrous inside, lobes 0.1–0.3 mm, triangular; corolla white, clavate in bud, when open salverform or infundibuliform, outside glabrous, tube 18–21 mm, 1.5–4 mm diam., inside villous at ca. middle, lobes 4–5 mm, triangular to ligulate, acute; anthers included, filaments inserted at ca. middle of corolla tube, 0.3–1 mm; style 18–21 mm, glabrous, stigmas 2.5–3 mm. *Short-styled flowers*: similar to long styled except calyx urceolate or cup-shaped, truncate or lobes to 0.3 mm; corolla outside glabrous or puberulent; tube 17.5–20 mm, 1.5–5.5 mm diam., lobes 4.5–5 mm; anthers shortly exerted, filaments inserted in upper third of corolla tube, 2.4–3 mm; style 8.5–10 mm, stigmas 3–3.5 mm. *Drupe* unknown.

Distribution and habitat. This species grows in Madagascar, where it is known from the province of Toamasina in the Mananara area and on the Masoala Peninsula. Here, it can be found in humid forests at elevations of 0–600 m.

Phenology. This species has been collected with flowers January through August and October through December, and with fruits in October.

Discussion. *Gaertnera lowryi* is similar to *G. letouzeyi* of Central Africa, but can be distinguished by its elliptic or oblanceolate leaves, 13 to 18 pairs of secondary veins, and pale greenish white calyx tube. In the field, *G. lowryi* is an impressive species with a pendulous inflorescence and reflexed uppermost leaves. *Gaertnera lowryi* is named for Porter Prescott “Pete” Lowry II (1956–), who made some of the first collections of the species and has made a number of important botanical collections from the Masoala Peninsula of Madagascar.

Paratypes. MADAGASCAR. **Toamasina:** Mananara-Nord National Park, *Malcomber et al.* 2888 (MO, TEF); Maroantsetra, Andranofotsy, Sahavary, *Schatz et al.* 1866 (MO), Hiaraka toward the rock, *Lowry et al.* 4036 (MO, TAN); Masoala Peninsula, Ambanizana, *Lowry et al.* 4155 (MO, P, TAN), *Malcomber et al.* 2742 (MO, TAN); Andranobe, *Malcomber* 2800 (MO, TEF), *Zjhra & Hutcheon* 392 (MO).

42. *Gaertnera macrobotrys* Baker, J. Linn. Soc., Bot. 20: 208. 1883. *Sykesia macrobotrys* (Baker) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Madagascar. Central Madagascar, *R. Baron* 1945 (holotype, K!; isotype, P!).

Trees or shrubs, 3–10 m tall; *branches* quadrangular, glabrous, 5–7 mm diam.; internodes 1.4–9.5 cm, smooth. *Leaf* blades 7.5–26 × 3.8–13 cm, elliptic-oblong to ovate or occasionally oblanceolate, apex rounded then sometimes abruptly cuspidate, base rounded to truncate, drying coriaceous or chartaceous, glabrous; secondary veins prominulous abaxially, 8 to 10 pairs; domatia absent; petioles 10–25 mm. *Stipules* tubular, inflated to funnel-shaped, glabrous, drying chartaceous, persistent on distalmost 1 to 2 nodes to deciduous often through fragmentation, often leaving a well-developed annular scar, tube 7–20 mm, with ribs none or 4, rounded to narrowly winged, arising beneath petiole and extending to base of tube, apex with 2 incisions, marcescent, lobes 4, 0.5–1 mm, deltate. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches or axillary, glabrous or puberulent; peduncle 1.5–10 cm; branched portion corymbiform, 5–15 × 4–22 cm, branched to 4 to 6 orders, lax to congested; bracts deltate or trifid, 1–10 mm; bracteoles triangular to lanceolate, 0.5–1.5 mm; pedicels absent or to 1.8 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 2–3 mm wide, outside glabrous, inside glabrous or usually with hair-ring, truncate or rarely with lobes to 0.3 mm, triangular; corolla white or pink, clavate in bud, when open salverform, outside glabrous, tube 7–10 mm, 2–3.5 mm diam., inside villous in upper third, lobes 2–2.5 mm, triangular to ligulate, acute; anthers included, filaments inserted at ca. middle of corolla tube, 0.8–1 mm; style 7–9 mm, glabrous or often pubescent near apex, stigmas 0.5–1.1 mm. *Short-styled flowers*: similar to long styled except calyx 1.5–3 mm wide, glabrous inside; corolla tube 6.5–10 mm, 1.5–3.5 mm diam., lobes ca. 3 mm; anthers shortly exerted, filaments inserted in upper third of corolla tube, 2–3 mm; style 4.5–5 mm long, stigmas 1.5–2 mm. *Drupe* violet-black, globose or subglobose, 8–9 × 8–10 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is known from the provinces of Fianarantsoa and Toamasina. Here, it can be found in humid forests at elevations of 660–1100 m.

Phenology. This species has been collected with flowers January through March and October through

December, and with fruits January through August and October through December.

Discussion. *Gaertnera macrobotrys* is similar to *G. arenaria*, *G. monstrosa*, and some plants of *G. obovata* var. *sphaerocarpa* with relatively large leaves (*G. macrobotrys* is easily separated from the remaining plants of *G. obovata* var. *sphaerocarpa* by its much larger leaves). However, *G. macrobotrys* can be distinguished from these by its elliptic-oblong to ovate or oblanceolate leaves, its inflated to funnel-shaped, shortly persistent to deciduous stipules that are partially split into two large, ovate lobes, and its usually terminal inflorescences. *Gaertnera macrobotrys* is also similar to *G. macrostipula*, but differs from it in its stipules usually deciduous after the top one or two nodes and usually elliptic-oblong or ovate leaves.

Representative specimens examined. MADAGASCAR. **Fianarantsoa:** Ranomafana National Park, *Malcomber* 2585 (K, MO, P, TAN), *Kotozafy* 267 (MO, P); Vohipeno, *Beaujard* 183 (K), 387 (K). **Toamasina:** Andasibe, *Perinet*, *Benoist* 1520 (P, TAN), *Dorr* 3222 (TAN), *Lowry* 4272 (P, TAN), *Miller* 3818 (MO, P, TAN), *Unknown Collector SF* 4250 (P, TEF); Mananara National Park, near Antanambe, *Morat* 8576 (P).

43. *Gaertnera macrostipula* Baker, J. Linn. Soc., Bot. 20: 207. 1883. *Sykesia macrostipula* (Baker) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Madagascar. Central Madagascar, *R. Baron* 1922 (lectotype, designated here, K!; isotypes, K!, P!).

Trees or shrubs, 2–7 m tall; *branches* flattened or terete or quadrangular, glabrous or puberulent with indumentum drying brown, 4–7 mm diam.; internodes 1.8–7 cm, smooth. *Leaf* blades 3.5–24 × 1.8–14.5 cm, oblanceolate to obovate, elliptic, or ovate, apex rounded then shortly cuspidate or acute, base acute and often decurrent, drying chartaceous, adaxially glabrous, abaxially glabrous or hirtellous along principal veins; secondary veins prominulous abaxially, 7 to 11(to 13) pairs; domatia absent or rarely present; petioles 18–20 mm. *Stipules* tubular, cylindrical or often inflated to funnel-shaped, glabrous or rarely puberulent, drying chartaceous, persistent, tube 10–33 mm, with ribs 4, rounded to narrowly winged, arising below petiole and sometimes extending along tube to lobes, apex entire or with 2 incisions, marcescent, lobes absent or 4, 1–2 mm, deltate. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches, sparsely to densely puberulent, pilosulose, or rarely glabrous; peduncle 2.5–11 cm; branched portion corymbiform, (1–)3–19 × (1–)4–16(–20) cm, branched to 3 to 5 orders, lax to congested; bracts deltate or trifid, 3–15 mm; bracteoles triangular, 1–3.5 mm; pedicels absent or to 2 mm. *Flowers* 5-merous, heterodistylous.

Long-styled flowers: calyx campanulate, 2–3.5 mm wide, outside sparsely to densely puberulent or glabrous, glabrous inside, truncate or lobes 1–3.5 mm, equal to markedly unequal, linear to spatulate; corolla white to dark pink, clavate in bud, when open infundibuliform or salverform, outside puberulent (glabrous), tube 7.5–8.5 mm, 2–3.5 mm diam., inside villous in upper third; lobes 2.5–3 mm, ligulate, acute; anthers included, filaments inserted in upper third of corolla tube, 0.5–1 mm; style 9–10 mm, glabrous, stigmas 0.5–1 mm. *Short-styled flowers:* similar to long styled except calyx lobes absent or 1.5–3.5 mm; corolla tube 6.5–9 mm, 1.3–3.5 mm diam., inside glabrous, lobes 2–3 mm, ligulate or linear; anthers shortly exerted, filaments 1–4 mm; style 2.5–3 mm, glabrous or pubescent, stigmas (0.2–)0.8–2 mm. *Drupe*s violet-black, globose to subglobose or didymous, 7–9 × 7–9.5 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is widespread. It lives in humid forests at elevations of 0–1800 m.

Phenology. This species has been collected with flowers January through March and August through December, and with fruits January through May and in November and December.

Discussion. This common species can be recognized by its well-developed, often funnel-shaped stipules that loosely surround the stem; additionally, on many stems the stipules are almost as long as the internodes and thus mostly cover the entire stem. The calyx lobes are usually linear to spatulate and well developed but rarely are absent. The flowers are usually dark pink but often bleach white in the sun. *Gaertnera macrostipula* is one of the most commonly collected *Gaertnera* species in Madagascar, growing in a variety of forest types from littoral forest near sea level to moss forest at 1800 m. It is similar to *G. macrobotrys*; see also comments under that species.

Two syntypes were cited in the protologue, *R. Baron* 1922 (K!, P!) and *W. T. Gerrard* 54 (K!). The former is selected here as lectotype because it is a more complete and exemplary specimen and has duplicates; the lectotype specimen is selected because it is the most complete specimen of the set.

Representative specimens examined. MADAGASCAR. **Antsiranana:** Anjanaharimbe Massif, *Humbert* 24621 (P); Anjanaharimbe-sud Nature Reserve, *Malcomber* 2676 (MO); Besinkara, *Gautier* 2514 (G, MO, P); Marojejy Nature Reserve, *Morat* 4150 (TAN), *S. Malcomber* 2705 (MO), 2709 (MO), 2774 (MO), 2777 (MO), 2778 (MO), 2782 (MO). **Fianarantsoa:** Ambodiamontana, Ranomafana, *Seigler* 12802 (MO); Matitanana Basin, Rienana Valley, *Humbert*

3450 (MO, P). **Toamasina:** Mantadia National Park, *Malcomber* 2920 (MO), *McPherson* 16553 (MO); Ambodiriana, *Perrier de la Bâthie* 17449 (MO, P); Andavikimenarana, *Dorr* 4484 (MO); Didy, Brickaville, *Cours* 4879 (P); Masoala National Park, *Malcomber* 2807 (MO), 2834 (MO); Masoala Peninsula, *Perrier de la Bâthie* 3649 (P).

44. *Gaertnera madagascariensis* (Hook. f.) Malcomber & A. P. Davis, Monogr. Syst. Bot. Missouri Bot. Gard. 104: 388, figs. 4, 5. 2005. Basionym: *Hymenocnemis madagascariensis* Hook. f., Gen. Pl. 2: 132. 1873. TYPE: Madagascar. s. loc., *W. Bojer* s.n. (holotype, K!).

Trees, 2–5 m tall; *branches* terete, when young densely pilosulose to villosulous, strigose, or sericeous with indumentum drying gray-white or brown to orange, sometimes becoming glabrescent, 0.4–3 mm diam.; internodes 0.4–2.5 cm, smooth. *Leaf* blades 0.5–4 × 0.3–2.5 cm, ovate to elliptic or obovate, apex acute to shortly acuminate (obtuse), base cuneate to rounded, drying chartaceous, glabrous; secondary veins visible and flat to prominulous abaxially, 3 to 5(6) pairs; domatia present; petioles 0.5–2.5 mm. *Stipules* calyptrate, densely villosulous to pilosulose or strigillose, drying membranous, caducous, persistent on distalmost 3 to 4 nodes, or deciduous through fragmentation, tube 3.5–23 mm, with ribs 4, narrowly winged, arising beneath petiole and sometimes extending along tube, apex with 1 incision, lobes 2, 0.3–0.6 mm, deltate. *Inflorescences* 1- to 3-flowered, fasciculate, terminal on principal and/or axillary branches; peduncles 2.5–12 mm, strigose to sericeous; bracts deltate, to 5 mm, glabrous or puberulent; bracteoles absent. *Flowers* 5-merous, heterodistylous. *Long-styled flowers:* calyx campanulate, 1.2–2.5 mm wide, glabrous, lobes 0.5–4 mm, triangular to linear; corolla white, clavate in bud, when open salverform, throughout glabrous, tube 5–10 mm, 2–4 mm diam.; lobes 3–5 mm, ligulate to elliptic-oblong, acute; anthers included, filaments inserted in upper third of corolla tube, 0.1–0.4 mm; style 7–10 mm, glabrous, stigmas 0.3–0.7 mm. *Short-styled flowers:* unknown. *Drupes* violet-black, globose or subglobose, 5–6 × 5–6 mm; pyrenes spherical to hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is widespread in the eastern escarpment. Here, it is found in humid evergreen forests on metamorphic and igneous rocks and rarely on alluvial deposits, at elevations of 800–1400 m.

Phenology. This species has been collected January through March and in November and December, and with fruits March through May.

Discussion. This species was originally separated in a monotypic genus, but molecular analyses indicate that *Hymenocnemis madagascariensis* is nested within the *Gaertnera* clade (Malcomber, 2002; Malcomber & Davis, 2005) and support its inclusion within *Gaertnera*. *Hymenocnemis* was originally circumscribed based on its superior ovary in the fruit, “sheathing” stipules, and inflorescence reduced to a single flower. All of these characters are found within *Gaertnera*, and this species also has *Gaertnera*’s characteristic stipular wings encircling the petiole. *Gaertnera madagascariensis* can be recognized by its densely appressed-pubescent young branches and stipules, its membranous calyptrate stipules, and its inflorescence reduced to one or a few flowers. This is the most commonly collected species in Madagascar of the group of *Gaertnera* species with solitary or few flowers discussed by Malcomber and Davis (2005). *Gaertnera madagascariensis* is similar to *G. brevipedicellata*; see additional comments under that species. Malcomber and Davis (2005) considered the conservation status of this species to be Least Concern (IUCN).

Representative specimens examined. MADAGASCAR. **Antananarivo:** Anjozorabe, *Bosser* 12839 (K, P, TAN), 8200 (TAN); Ankeramadrinka, Ambatolaona, 65 km E of Antananarivo, *Leandri* 3204 (P). **Fianarantsoa:** Andringitra Massif, Ambodipaiso Forest, *Cours* 2286 (P), *Homolle* 2286 (P, TAN); Ranomafana National Park, Vatoharanana, *Malcomber* 2865 (MO), 2870 (MO). **Toamasina:** Analamazoatra, *Perrier de la Bâthie* 6892 (K, P); Bemainty Massif, Rahobeava, *Cours* 4177 (P, TAN).

45. *Gaertnera microphylla* Capuron ex Malcomber & A. P. Davis, Monogr. Syst. Bot. Missouri Bot. Gard. 104: 390, figs. 2, 6. 2005. TYPE: Madagascar. Toamasina: 6.6 km SE of Andasibe, small ridge beside RN2 at base of Andriandavibe, 18°56’S, 48°29’E, 23 Nov. 1997, *S. T. Malcomber, A. P. Davis, D. Gower & J. Andriantiana* 2925 (holotype, MO!; isotypes, A!, BR!, G!, K!, LE!, MAL!, MAU!, P!, PRE!, TEF!, UPS!, WAG!).

Trees or shrubs, 2–4 m tall; *branches* flattened to terete, glabrous, 0.4–3.4 mm diam.; internodes 0.1–0.6 cm, with 2 longitudinal ribs. *Leaf* blades 0.3–1.5 × 0.3–0.8 cm, cuneiform to spatulate or obovate, apex obtuse to acute or shortly acuminate or mucronulate, base acute to attenuate, drying membranous, glabrous; secondary veins hardly visible to prominulous abaxially, 3 to 4 pairs; domatia absent or present and foveolate; petioles 0.5–1.2 mm. *Stipules* calyptrate, glabrous, drying membranous, persistent, quickly splitting into 4 narrowly spatulate to linear segments, tube 4–5 mm, with ribs 4, narrowly to broadly winged, arising beneath petiole and extending

along each persistent segment; apex with 2 or 4 incisions, lobes 4, 1–1.5 mm, linear. *Inflorescences* reduced to 1 flower, terminal on axillary branches; bracts stipuliform, involucral; bracteoles absent. *Flowers* 4-merous, heterodistylous, subsessile. *Long-styled flowers*: calyx cup-shaped, 1.5–2 mm wide, glabrous, lobes 2.4–3 mm, linear to oblanceolate or ligulate; corolla white, clavate in bud, when open salverform, outside glabrous, tube 4–4.5 mm, 1.5–3 mm diam., inside villous at ca. middle, lobes 2–2.5 mm, triangular to ligulate, obtuse; anthers included, filaments inserted in upper third of corolla tube, 0.2–0.4 mm; style 4.5–5 mm, glabrous, stigmas 0.9–1.3 mm. *Short-styled flowers*: unknown. *Drupe*s blue, didymous, 5–6.2 × 6.5–7 mm; pyrenes hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is known from the province of Toamasina. Here, it can be found in wet evergreen forests on metamorphic and igneous rocks at elevations of 790–1050 m.

Phenology. This species has been collected with flowers in November and December and with fruits in March through May.

Discussion. This species is distinctive in its relatively small leaves that are broadest near the apex and its stipules that quickly split into four narrow, persistent segments. The stipules or stipule segments cover the stem and overlap due to the reduced internodes. The calyx with its well-developed narrow lobes resembles the stipules. This species is only known from around Andasibe and Analamazotra; it was given a conservation status of Critically Endangered (IUCN, 2001) by Malcomber and Davis (2005). *Gaertnera microphylla* and *G. furcellata* are similar and in particular share the unusual stipules and inflorescences reduced to a single flower; they differ primarily in their respective distinctive leaf shapes.

Additional specimens examined. MADAGASCAR. **Toamasina**: Betw. Perinet & Anevoka, base de rocher de l'Andriandavibe, *Capuron SF 24355* (MO, P, TEF), *SF 24770* (MO, P, TEF); region of Saharanga mountain pass, NE of Perinet, *Capuron SF 24022* (MO, P, TEF); Andasibe (Perinet), N of rd. from Antananarivo to Tametave, *Lowry & Schatz 4283* (MO).

46. *Gaertnera monstrosa* Malcomber, sp. nov.
TYPE: Madagascar. Toamasina: 6.4 km W of Antanambe, Mananara National Park, lowland rainforest, 16°27'S, 49°48'E (WGS 84 map datum), 180 m, 16 Nov. 1997, *S. T. Malcomber 2887* (holotype, MO!; isotypes, BR!, K!, P!, TEF!, WAG!). Figure 12A–D.

Haec species *Gaertnerae obesae* Hook. f. ex C. B. Clarke similis, sed ab ea caule in sectione transversali subquadrangulati, floribus hermaphroditis distylis atque tubo corollino 15–20 mm longo distinguitur.

Trees or shrubs, 1–5 m tall; *branches* quadrangular, glabrous, 2–15 mm diam.; internodes 3.5–26 cm, smooth. *Leaf* blades 35–51 × 10.5–14.6 cm, elliptic to oblanceolate or obovate, apex acuminate, base acute to cuneate, drying chartaceous to coriaceous, glabrous; secondary veins prominulous abaxially, 12 to 16 pairs; domatia absent; petioles 15–25 mm. *Stipules* tubular, funnel-shaped, glabrous, drying coriaceous, persistent at least on distalmost 3 or 4 nodes, tube 18–51 mm, with ribs 4, broadly winged, arising below petiole and extending to lobes, apex with 2 deep incisions producing 2 broadly oblong to elliptic segments, apices acute or sometimes tardily splitting, without lobes. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches or sometimes on reduced axillary branches and appearing axillary, puberulent, sessile or peduncle to 11 cm; branched portion corymbiform, 3.8–18.5 × 6–26 cm, branched to 3 to 4 orders, lax to congested; bracts deltate or trifid, 0.5–2.2 mm, sometimes glabrous; bracteoles triangular to rounded, 0.1–0.5 mm; pedicels absent or to 0.5 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 1.8–3 mm wide, outside puberulent, with hair-ring inside, truncate; corolla white, clavate in bud, when open salverform, glabrous throughout, tube 15–20 mm, 1.5–2.5 mm diam., lobes 3–4.5 mm, ligulate or elliptic-oblong, acute; anthers included, filaments inserted at middle to upper third of corolla tube, 1–2 mm; style 16–20 mm, glabrous, stigmas 2–3 mm. *Short-styled flowers*: similar to long styled except calyx 1.5–2.5 mm wide; corolla tube 12–13.5 mm, 1.8–2.5 mm diam., lobes 4–5 mm, ligulate; anthers included, filaments 1.2–1.4 mm; style 3.5–4 mm, stigmas 1.5–2 mm. *Drupe*s unknown.

Distribution and habitat. This species grows in Madagascar, where it is known from the province of Toamasina, in the Soanierana-Ivongo and Mananara Nord National Parks. Here, it can be found in humid forests at elevations of 180–400 m.

Phenology. This species has been collected with flowers August through November but has not been collected with fruits.

Discussion. *Gaertnera monstrosa* is similar to *G. obesa* of Southeast Asia, but differs from that species in its more squared stems, larger flowers, and stamens inserted in the middle or upper third of the corolla tube. Additionally, *G. monstrosa* has bisexual distylous flowers, whereas *G. obesa* is dioecious. Within Madagascar, *G. monstrosa* is similar to *G. macrobotrys*, but can be separated from it by its

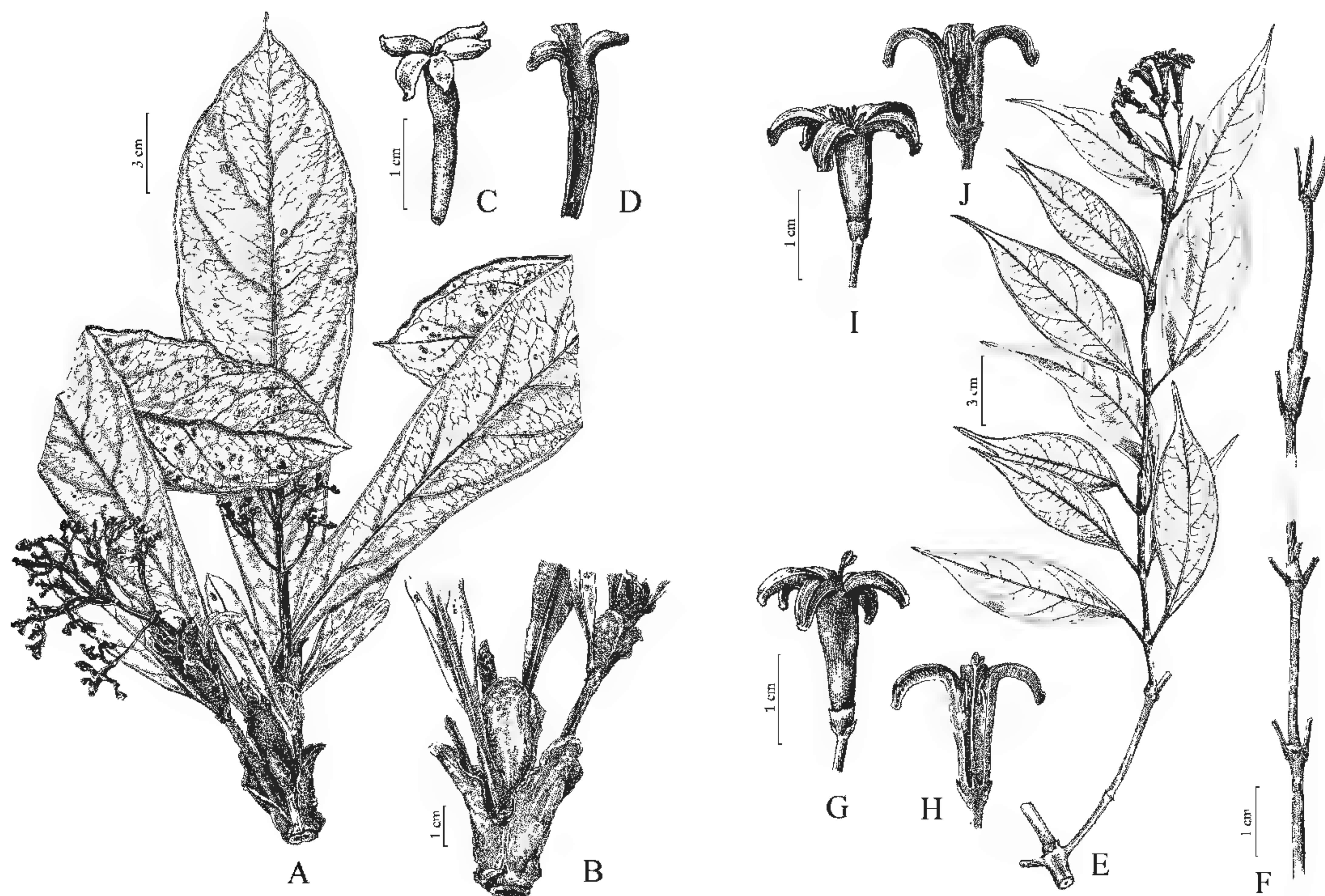


Figure 12. A–D. *Gaertnera monstrosa* Malcomber. —A. Fruiting branch. —B. Portion of stem with leaf bases and stipules. —C. Short-styled flower. —D. Short-styled flower in cross section. E–J. *Gaertnera walkeri* (Arn.) Blume. —E. Flowering branch. —F. Portion of stem with petiole bases, stipules, and stem apex. —G. Long-styled flower. —H. Long-styled flower in cross section. —I. Short-styled flower. —J. Short-styled flower in cross section. C, D to same 1-cm scale; G, H to same 1-cm scale; I, J to same 1-cm scale. A–D based on *Malcomber 2887*; E–J based on *Malcomber 2771*.

relatively large, elliptic to obovate or oblanceolate leaves, often apparently axillary inflorescences, and larger flowers. The specific epithet refers to the proportionally large size of the leaf blades, stipules, and stem.

Paratypes. MADAGASCAR. **Toamasina:** Mananara-Nord National Park, Ibanda, *Malcomber et al.* 2909 (MO); S of Soanierana-Ivongo, Sahavolamena, *Capuron SF 23800* (TEF); Sahafotra, N of Navana (Bay of Antongil), *Capuron SF 28396* (TEF).

47. *Gaertnera obesa* Hook. f. ex C. B. Clarke, in Hook. f., *Fl. Brit. India* 4: 92. 1885. *Psychotria obesa* Wall., *Cat. n.* 8328. 1847, nom. nud. *Uragoga stipulacea* Kuntze, *Revis. Gen. Pl.* 2: 426. 1891, nom. superfl. TYPE: Singapore. *N. Wallich 8328* (holotype, K!; isotype, K!).

Shrubs or trees, 2–5 m tall; branches terete to quadrate, glabrous, 5–10 mm diam.; internodes 4–11 cm, smooth. Leaf blades 20–55 × (7–)9–19 cm, obovate to oblong, apex acuminate to acute, base attenuate to cuneate or sometimes attenuate, drying coriaceous, glabrous, margin flat and with cartilaginous thickening; secondary veins prominulous abaxially, 9 to 13 pairs; domatia absent; petioles 1–10 cm,

furrowed and sometimes with 2 lateral ridges formed by attenuate leaf base. Stipules tubular, funnel-shaped, glabrous to puberulent, drying chartaceous to coriaceous, deciduous via fragmentation, tube 20–50(–75) mm, with ribs 4, broadly winged, arising below petiole and extending to lobes, apex with 2 deep incisions producing 2 broadly oblong sections with acute to rounded apices, lobes 4, 3–4 mm, deltate to narrowly triangular, ciliolate. Inflorescences cymose, many-flowered, terminal on axillary branches or rarely axillary, puberulent; peduncle 2–11 cm; branched portion corymbiform, 2–8 × 3–10 cm, branched to 3 to 5 orders, rather congested; bracts linear to ovate, 0.5–12 mm, glabrous; bracteoles reduced; pedicels absent or to 1 mm. Flowers 5-merous, unisexual. Pistillate flowers: calyx cup-shaped, 2–3 mm wide, outside glabrous or puberulent, with hair-ring inside, truncate; corolla white, clavate in bud, when open salverform, outside glabrous, tube 7–9 mm, 1.5–2 mm diam., inside villous in upper third, lobes 1.8–2.5 mm, ligulate, acute; staminodia included, filaments inserted in lower third of corolla tube, ca. 0.3 mm; style 3–3.5 mm, glabrous, stigmas 1.3–1.5 mm. Staminate flowers: similar to pistillate except corolla tube 7–10 mm, 2–3 mm diam., lobes

2–2.5 mm; anthers included, filaments ca. 0.5 mm; pistillode reduced or absent. *Drupes* violet-black, globose to didymous, 8–10 × 10–12 mm; pyrenes hemispherical or spherical, faintly rugose, deeply fissured, endosperm entire.

Distribution and habitat. This species grows in southeastern Asia, where it is known from Peninsular Malaysia, Singapore, and the Sarawak (Malaysia) sector of Borneo. Here, it can be found in humid forests at elevations of 10–300 m.

Phenology. This species has been collected with flowers January through March and August through December, and with fruits in April.

Discussion. *Gaertnera obesa* is similar to *G. monstrosa* of Madagascar, but can be distinguished by its cylindrical stems, smaller flowers, and stamens and staminodes inserted in the lower third of the corolla tube. Additionally, *G. obesa* is dioecious, whereas *G. monstrosa* is bisexual and distylous. Van Beusekom (1967) noted that the field notes of several collections of *G. obesa* mention that the plants harbored ants. One collection, *Cantley's Collector 3008* (SING), is intermediate between *G. obesa* and *G. grisea* and presumably a natural hybrid.

Representative specimens examined. MALAYSIA. **Johor:** N of Mawai, Panti Forest Reserve, *Malcomber 3025* (MO), *Suppiah KEP 98992* (KEP); Sungai Kayu, *Kiah SING 32110* (BM, K, KEP, SING). **Pahang:** path to Gunong Lesong, Rompin, *Shah 3090* (SING). **Perak:** s. loc., *Ridley 1440* (K). **Sarawak:** Sibui, Ulu Sg. Pasai, Bukit Tanggi, *Yii S 64422* (SAR). SINGAPORE. Singapore Botanic Gardens, Garden Jungle, 7 Mar. 1926, *C. X. D. R. Furtado s.n.* (SING); Upper Peirce Reservoir Nature Reserve, *Malcomber 3007* (MO, SING).

48. *Gaertnera oblanceolata* King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 4: 92. 1907. TYPE: Malaysia. Perak: Sungai Luat, *L. Wray, Jr. 2283* (lectotype, designated here, SING!; isotype, G!). Figure 4A–F.

Trees, 1–2.5 m tall, often monocaulous; branches terete or quadrangular, glabrous, 2–6 mm diam.; internodes 1.1–7 cm, smooth. *Leaf* blades 11–31 × 4–10 cm, oblanceolate or obovate, apex cuspidate to acuminate, base attenuate to cuneate, drying coriaceous, glabrous or puberulent abaxially on principal veins, margin flat and sometimes thinly cartilaginous; secondary veins prominulous abaxially, 6 to 15 pairs; domatia absent or present; petioles 3–40 mm. *Stipules* tubular, glabrous, drying chartaceous, deciduous, persistent on distalmost nodes or deciduous leaving a persistent base 5–10 mm, tube 11–20 mm, with ribs 4, broadly winged, arising below petiole and extending to lobes, apex entire or with 1 incision, marcescent, lobes 4, 1–3 mm, deltate to linear.

Inflorescences congested-cymose to subcapitate, many-flowered, axillary or paired and supra-axillary, densely puberulent to pilosulose; peduncle 1.5–8 cm; branched portion subglobose or narrowly pyramidal, 2.5–11.5 × 1–6 cm, branched to 2 to 4 orders; bracts deltate or linear, 3–10 mm, sometimes glabrous; bracteoles reduced; pedicels absent or up to 3 mm. *Flowers* 5-merous, unisexual. *Pistillate flowers:* calyx cup-shaped, 1.5–3 mm wide, outside puberulent, with hair-ring inside, truncate or lobes to 0.2 mm, triangular; corolla white, clavate in bud, when open salverform, outside glabrous, tube 4–5 mm, 1.5–2.5 mm diam., inside villous in upper third, lobes 1–1.4 mm, triangular to ligulate, acute; staminodia included, filaments inserted in upper third of corolla tube, ca. 0.3 mm; style 3.5–4 mm, glabrous, stigmas 0.5–0.8 mm. *Staminate flowers:* similar to pistillate except calyx 1.5–2.5 mm wide, outside glabrous or puberulent; lobes ca. 0.3 mm; corolla tube 2.5–4.5 mm, 1–2 mm diam., lobes 1.3–1.7 mm; anthers shortly exserted, filaments 0.2–0.4 mm; pistillode with style portion 2–3.5 mm, stigmatic portions 1–1.5 mm. *Drupes* violet-black, globose or subglobose, 4–6 × 4–8 mm; pyrenes spherical or hemispherical, ± rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in southeastern Asia, where it has most commonly been collected in Peninsular Malaysia and is also known from the Sarawak (Malaysia) sector of Borneo. Here, it is found in humid forests at elevations of 30–1500 m.

Phenology. This species has been collected with flowers April through August and in November, and with fruits in August.

Discussion. *Gaertnera oblanceolata* is similar to *G. diversifolia*, but *G. oblanceolata* differs in its subglobose, axillary and supra-axillary inflorescences, versus lax pyramidal inflorescences that are terminal on axillary and supra-axillary branches. *Gaertnera diversifolia* was treated as a variety of *G. oblanceolata* by van Beusekom (1967), one of several species circumscribed more broadly by him than here.

Four syntypes were cited in the protologue: *L. Wray, Jr. 2283* (G!, SING!), *L. Wray, Jr. 1948* (G!), *Scortechini 253* (not located), and *King's Collector 8449* (not located). The first collection is here selected as lectotype because it is more complete and exemplary, and because it has two specimens deposited in different herbaria. The specimen at SING is selected as the lectotype because it is more complete.

Representative specimens examined. MALAYSIA. **Negeri Sembilan:** Pasoh Forest Reserve, *Wong FRI 28905* (KEP), *Wong FRI 2891* (KEP), *Malcomber 3021* (MO), *3022* (MO).

Perak: Bukit Blakang Parang, *Hanift SING 21055* (K, L, SING). **Sarawak:** Miri Distr., Niah National Park, *Malcomber 3039* (MO), *3040* (MO), June 1894, *M. R. Haviland s.n.* (K). **Selangor:** Kanching, Bukit Batu Berdinging, *Nur SING 34357* (A, K, KEP, L, SING).

49. *Gaertnera obovata* Baker, J. Bot. 20: 218. 1882. *Sykesia obovata* (Baker) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Madagascar. Chiefly from Betsileo-land, *R. Baron 149* (holotype, K!; isotype, P!). Figure 13A–L.

Trees or shrubs, 1.5–5(–12) m tall; *branches* flattened to quadrangular or terete, glabrous or puberulent, 2–9 mm diam.; internodes 0.3–6.5 cm, smooth or with 2 longitudinal ribs at least when young. *Leaf* blades 1.2–7(–23) × 0.7–8.5 cm, elliptic to oblanceolate, elliptic-obovate, elliptic-oblong, or ovate, apex acute to rounded then abruptly short-acuminate or cuspidate, base acute to obtuse, drying chartaceous, adaxially glabrous, abaxially glabrous or puberulent, margin flat or crisped; secondary veins visible and flat to prominulous, 5 to 16 pairs; domatia absent or present; petioles 2–25 mm. *Stipules* calyptrate, glabrous, drying membranous or chartaceous, caducous or deciduous after distalmost 1 or 2 nodes, tube 8–32 mm, with ribs 4, narrowly winged, arising below petiole and sometimes extending to lobes, apex entire or with 1 incision, lobes 2, 2–3.5 mm, deltate to linear. *Inflorescences* cymose, several- to many-flowered, terminal on principal and/or axillary branches, glabrous or puberulent to pilosulose, sessile or peduncle 0.8–3 cm; branched portion corymbiform to pyramidal, 1.1–12.5 × 1.3–15.5 cm, branched to 3 to 5 orders, lax to congested; bracts deltate to ligulate or trifid, 0.8–40 mm; bracteoles lanceolate to triangular, 1–2 mm; pedicels absent or to 3 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 1.5–3.5 mm wide, outside glabrous or puberulent, sometimes with hair-ring inside, truncate or with lobes 0.1–1.1 mm, triangular; corolla white, pink, or lilac, clavate in bud, when open salverform, outside glabrous, tube 3–7 mm, 1.5–2.5 mm diam., inside villous in upper third, lobes 2–3.5 mm, ligulate to elliptic-oblong, acute; anthers included or shortly exerted, filaments inserted in upper third of corolla tube, 0.3–1 mm; style 3.3–8.2 mm, glabrous, stigmas 0.8–1.6 mm. *Short-styled flowers*: similar to long styled except corolla tube 4–9 mm, 1.7–3.5 mm diam., lobes 2.3–4 mm; anthers shortly exerted, filaments 1.3–3.5 mm; style 2.7–5.2 mm, glabrous, stigmas 1.3–3 mm. *Drupe*s violet-black, globose or didymous, 4–10 × 5–10 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is known from the provinces of

Antananarivo, Antsiranana, Fianarantsoa, Mahajanga, Toamasina, and Toliara. Here, it is found in moist forests at elevations of 0–2000 m.

Phenology. This species has been collected with flowers January through March and May through December, and with fruits January through April and October through December.

Discussion. *Gaertnera obovata* is the most commonly encountered *Gaertnera* species within Madagascar, in particular its variety *sphaerocarpa*. The species is distinguished by its generally squared stem; caducous calyptrate stipules; generally elliptic-obovate, obovate, or oblanceolate, acuminate to cuspidate leaves; and terminal cymose inflorescences. This species is similar to *G. guillotii*, but lacks the inflorescence axes often pubescent in lines that are characteristic of that species.

Gaertnera obovata var. *obovata* and variety *sphaerocarpa* are easily distinguished at the extremes of their morphological ranges, but are linked by continuous morphological variation in several characters and thus are not completely distinct. The well-marked, most distinct morphological forms differ markedly in leaf shape, leaf margin, and flower color: variety *obovata* typically has elliptic-oblong to obovate leaves with flat margins and pink to lilac flowers, whereas variety *sphaerocarpa* usually has elliptic-oblong to oblanceolate leaves with crisped margins and white flowers. The current circumscription of these varieties is not entirely satisfactory; these are separated here as outlined below pending additional research.

- 1a. Leaves elliptic to elliptic-oblong, oblanceolate, obovate, or ovate, 1.2–8.5 × 0.7–5.2 cm, with margins flat; corolla pink to lilac or white; long-styled flowers with anthers included; drupes 4–5 × 5–6 mm 49a. variety *obovata*
- 1b. Leaves elliptic-oblong to oblanceolate, 4.5–23 × 1.9–8.5 cm, with margins flat or crisped; corolla white; long-styled flowers with anthers shortly exerted; drupes 6–10 × 5–10 mm 49b. variety *sphaerocarpa*

49a. *Gaertnera obovata* Baker var. ***obovata***.
Figure 13A–F.

Trees or shrubs 1.5–5(–12) m tall; *branches* flattened to terete, glabrous, 2–3 mm diam.; internodes 0.3–4.5 cm, smooth or with 2 longitudinal ribs at least when young. *Leaf* blades 1.2–7(–8.5) × 0.7–5.2 cm, elliptic to elliptic-oblong, oblanceolate, obovate, or ovate, apex rounded then abruptly shortly acuminate, base acute to obtuse, drying chartaceous, glabrous, margins flat; secondary veins 5 to 8 pairs; petioles 2–10 mm. *Stipules* drying membranous to chartaceous, tube 12–20 mm, lobes 3.2–3.5 mm. *Inflorescences* with peduncle 0.8–3 cm; branched

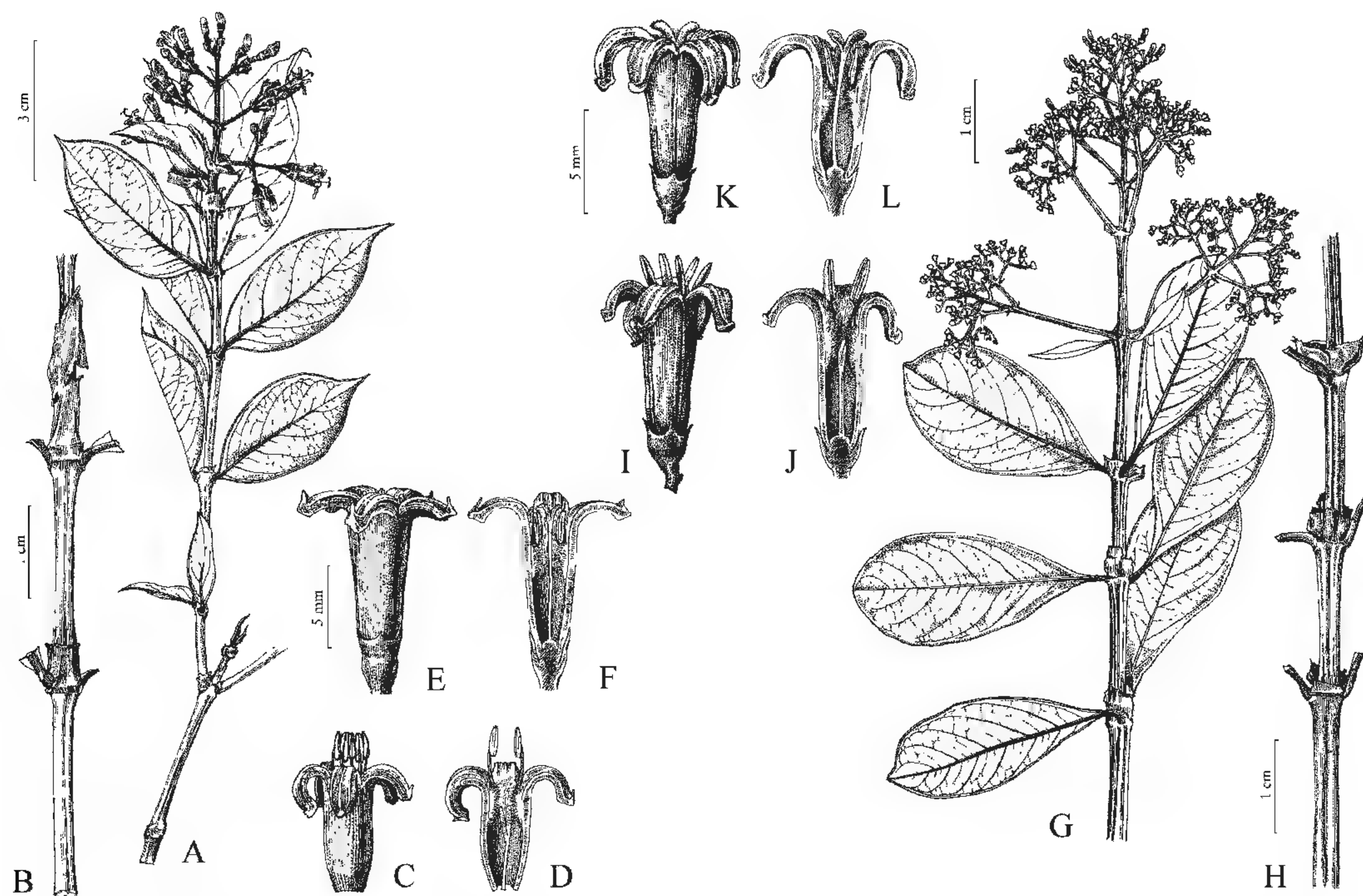


Figure 13. A–F. *Gaertnera obovata* Baker var. *obovata*. —A. Flowering branch (to 3-cm scale). —B. Portion of stem with leaf bases and stipules. —C. Short-styled flower. —D. Short-styled flower in cross section. —E. Long-styled flower. —F. Long-styled flower in cross section. G–L. *Gaertnera obovata* var. *sphaerocarpa* (Baker) Malcomber. —G. Flowering branch. —H. Portion of stem with petiole bases and stipules. —I. Short-styled flower. —J. Short-styled flower in cross section. —K. Long-styled flower. —L. Long-styled flower in cross section. C–F to same 5-mm scale; I–L to same 5-mm scale. A–F based on *Malcomber 2882*; G–L based on *Malcomber 2916*.

portion corymbiform, $1.1\text{--}5 \times 1.3\text{--}4.5$ cm; bracts 8–27 mm; pedicels absent or to 3 mm. *Long-styled flowers*: calyx 1.5–3.5 mm wide, with hair-ring inside, lobes 0.1–1.1 mm; corolla white to pink or lilac, tube 3.5–7 mm, 1.5–2.5 mm diam., lobes 2–3.5 mm, ligulate to elliptic-oblong; anthers included, filaments 0.3–1 mm; style 5.5–8.2 mm, stigmas 1–1.6 mm. *Short-styled flowers*: corolla tube 4–9 mm, 1.7–3.5 mm diam., lobes 2.5–4 mm, ligulate; filaments 1.3–1.7 mm; style 2.8–5.2 mm, stigmas 1.7–3 mm. *Drupe* $4\text{--}5 \times 5\text{--}6$ mm; pyrenes hemispherical.

Distribution and habitat. This variety grows in Madagascar, where it is known from the provinces of Antananarivo, Antsiranana, Fianarantsoa, Mahajanga, and Toamasina. Here, it is found in moist forests at elevations of 10–2000 m.

Phenology. This variety has been collected with flowers January through March and May through December, and with fruits January through March and October through December.

Representative specimens examined. MADAGASCAR. **Antananarivo:** 5.7 km ESE of Anjozorobe, *Malcomber 2838* (MO, TEF); Ambohitantely Special Reserve, *Bernardi*

11097 (A, BR, G, P); Manjakandriana, Ambatolaona, *Rakoto RN 1487* (P). **Antsiranana:** Anjanaharibe-Sud Special Reserve, *Lewis 1306* (K, MO, P, TAN); Marojejy Nature Reserve, *Malcomber 2776* (MO), *2793* (MO), *2799* (MO); lower valley of Androranga River, near Antongondriha, Mt. Anjenabe, *Humbert 24117* (P); Manongarivo Nature Reserve, *Schatz 3211* (MO, P, TAN), *Malcomber 1460* (K, MO, TAN), *2786* (MO); Tsaratanana Nature Reserve, *Humbert 18201* (P). **Fianarantsoa:** Andrambovato, *Capuron SF 255* (MO); Andringitra Integral Reserve, *Lewis 1030* (K, MO, P, TAN); Antoetra, *Jongkind 878* (K, MO, P, TAN); Ranomafana National Park, *Malcomber 106* (BR, G, K, MO, P, PRE, TAN, WAG), *2869* (MO, TEF), *2881* (MO), *2882* (MO, TEF). **Mahajanga:** Bealanana, *R.-J. Dufournet s.n.* (P). **Toamasina:** Ambatoloana, *Benoist 297* (P, TAN); 6.6 km SE of Andasibe, Andriandavibe, *Malcomber 2926* (MO, TEF); Lac Aloatra, Mt. Ankaraoka, *Humbert 17480* (P); Mantadia National Park, *Nicoll 170* (MO); Masoala National Park, Andranobe, *Malcomber 2819* (MO).

49b. *Gaertnera obovata* var. *sphaerocarpa* (Baker) Malcomber, comb. et stat. nov. Basionym: *Gaertnera sphaerocarpa* Baker, J. Linn. Soc., Bot. 20: 208. 1883. *Sykesia sphaerocarpa* (Baker) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Madagascar. Central Madagascar, *R. Baron 1243* (lectotype, designated here, K!; isotype, P!). Figure 13G–L.

Trees 1.5–12 m tall; *branches* flattened or quadrangular to terete, glabrous or puberulent, 3–9 mm diam.; internodes 1.8–6.5 cm, smooth. *Leaf* blades 4.5–23 × 1.9–8.5 cm, oblanceolate to elliptic-oblong, apex acute to rounded then abruptly shortly cuspidate, base acute to cuneate, drying chartaceous, adaxially glabrous, abaxially glabrous or puberulent, margin flat or crisped; secondary veins 5 to 10(to 16) pairs; petioles 3–25 mm. *Stipules* drying membranous, tube 8–25(–32) mm, lobes 2–3 mm. *Inflorescences* sessile or peduncle to 2.5 cm; branched portion corymbiform to pyramidal, 3.5–8.5(–12.5) × 6.5–12(–15.5) cm; bracts 0.8–40 mm; pedicels absent or to 2 mm. *Long-styled flowers*: calyx 1.5–2.5 mm wide, glabrous or with hair-ring inside, truncate or with lobes to 0.5 mm, triangular; corolla white, tube 3–5.5 mm, 2–2.5 mm diam., lobes 2.1–2.4 mm, ligulate; anthers shortly exserted, filaments 0.3–0.5 mm; style 3.3–5.8 mm, stigmas 0.8–1.4 mm. *Short-styled flowers*: similar to long styled except calyx 1.7–2.2 mm; corolla tube 4–6 mm, 1.7–2.5 mm diam., lobes 2.3–2.6 mm; filaments 1.4–3.5 mm; style 2.7–3.5 mm, stigmas 1.3–2.5 mm. *Drupe*s 6–10 × 5–10 mm; pyrenes spherical or hemispherical.

Distribution and habitat. This variety grows in Madagascar, where it is known from the provinces of Antananarivo, Antsiranana, Fianarantsoa, Toamasina, and Toliara. Here, it grows in moist forests at elevations of 0–1600 m.

Phenology. This variety has been collected with flowers in January and July through December, and with fruits January through April and in December.

Discussion. This variety is similar to *Gaertnera macrobotrys*; see additional comments under that species.

Two syntypes were cited in the protologue: *R. Baron 1233* (K!, P!) and *R. Baron 1243* (K!, P!). The latter is selected as lectotype here because it is a more complete and exemplary specimen. The specimen at K is selected as the lectotype because the author of the name worked there.

Representative specimens examined. MADAGASCAR. **Antananarivo:** 5.7 km ESE of Anjozorobe, *Malcomber 2836* (MO, TEF), *2837* (MO, TEF). **Antsiranana:** Andapa, Lokoho Basin, Ankobahina Hills, *Humbert 22019* (MO, P); Marojejy Nature Reserve, *Malcomber 2783* (MO, TEF), *2788* (MO, TEF), *2789* (MO). **Fianarantsoa:** Andrambovato, *Humbert 28500* (MO, P); Farafangana, Ivongo, *Rakotovao 593* (TEF), *607* (TEF); Ranomafana National Park, Vohiparara, *Malcomber 2857* (MO, TEF), *2859* (MO, TEF); W of Ambositra, Itremo Massif, *Malcomber 2839* (MO, TEF), *2840* (MO, TEF). **Toamasina:** near Andasibe, Mantadia National Park, *Birkinshaw 296* (MO), *Malcomber 2917* (MO), *2918* (MO, TEF), *2919* (MO, TEF), *2928* (MO, TEF), *2929* (MO, TEF); Analamay rd., *Rakotomalaza 1317* (MO, TAN); Didy, Brickaville, *Cours 4790* (MO, P). **Toliara:** Andohahela Massif, Ranohela Valley, *Humbert 6250* (MO, P); Beampin-

gartra Massif, Maloto Valley, *Humbert 6322* (MO, P); Fort Dauphin, Mandena, *Bosser 14413* (TAN).

50. *Gaertnera paniculata* Benth., Niger Fl. 459. 1849. *Sykesia paniculata* (Benth.) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Nigeria. Grand Bassa, *S. Vogel 71* (lectotype, designated here, K!).

Gaertnera occidentalis Baill., Bull. Mens. Soc. Linn. Paris 1: 235. 1880. TYPE: Gabon. s. loc., *G. du Bellay et al. 232* (holotype, P!).

Trees or shrubs, (1.2–)2–9 m tall; *branches* flattened to terete, when young glabrous or puberulent, becoming glabrescent, 2–6 mm diam.; internodes 2–8 cm, smooth or with a low ridge. *Leaf* blades 8–18 × 3–9 cm, elliptic to elliptic-oblong or oblanceolate, apex shortly cuspidate or acuminate, base cuneate to obtuse, drying chartaceous, adaxially glabrous, abaxially glabrous or sparsely pilosulose to hirtellous on principal veins; secondary veins prominent abaxially, 3 to 8 pairs; domatia absent or present; petioles 5–17 mm. *Stipules* tubular, glabrous, drying chartaceous, caducous, persisting on distalmost 1 to 3 nodes or deciduous leaving persistent base 1–5 mm, tube 8–20 mm, with ribs 4, narrowly winged, arising below petiole and extending to lobes, apex entire, marcescent, lobes 4, 0.5–1.2 mm, deltate to narrowly triangular. *Inflorescences* cymose to paniculiform, many-flowered, terminal on principal and/or axillary branches, densely puberulent to glabrescent or pilosulose, sessile or peduncle to 8 cm; branched portion corymbiform or narrowly pyramidal, 7–20 × 4–25 cm, branched to 4 to 6 orders, lax; bracts deltate or trifid, 1–2.2 mm, sometimes glabrous; bracteoles reduced; pedicels absent or to 0.3 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 1.2–2 mm wide, glabrous or puberulent outside, with hair-ring inside, truncate or lobes to 1 mm, triangular; corolla white, clavate in bud, when open salverform, outside densely puberulent, tube 3–4 mm, 1–2.5 mm diam., inside villous in upper third, lobes 1.5–2.5 mm, ligulate to linear, acute; anthers shortly exserted, filaments inserted in upper third of corolla tube, ca. 0.3 mm; style 6–7 mm, glabrous or pubescent in upper part, stigmas 0.5–1.5 mm. *Short-styled flowers*: similar to long styled except corolla outside tomentulose or puberulent, tube 2.5–4 mm, lobes 1.5–2 mm, ligulate; anthers fully exserted, filaments 2–2.5 mm; style 1.5–2 mm, stigmas 0.7–1 mm. *Drupe*s violet-black, globose or subglobose, 7–9 × 6–9 mm; pyrenes spherical or hemispherical, ± rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in West and Central Africa, where it is widespread and

known from Angola, Benin, Burkina Faso, Cameroon, the Central African Republic, the Democratic Republic of the Congo, Gabon, Ghana, Guinea, Côte d'Ivoire, Liberia, Mali, Nigeria, the Republic of the Congo, Senegal, Sierra Leone, Togo, and Zambia. Here, it is found in humid forests at elevations of 0–1720 m.

Phenology. This species has been collected with flowers and fruits throughout the year.

Discussion. *Gaertnera paniculata* is similar to *G. vaginans* and *G. longivaginalis*, but differs in its externally densely puberulent or tomentulose corolla tubes. This is the most commonly collected species of *Gaertnera* in Africa.

Two syntypes were cited in the protologue of *Gaertnera paniculata*, *S. Vogel* 70 (K!) and *S. Vogel* 71 (K!). The latter is selected as lectotype here because it is a more complete and exemplary specimen.

Representative specimens examined. ANGOLA. Dundo, *Gossweiler* 14108 (K); Estrada, *Raimundo* 2846 (BR). BENIN. Natitingau, *Aubréville* 81 (P); Tohoué, Porto-Novo, *Chevalier* 22774 (P). BURKINA FASO. Guenako, *Toutain* 2408 (P). CAMEROON. 17 km S of Meiganga, *W. de Wilde* 3945 (WAG); Rocher du Loup, *Lowe* 3623 (FHO, K, P). CENTRAL AFRICAN REPUBLIC. Bouar, *Audru* 29996 (P); near Mbanza, Km 15 Nola–Salo rd., *Leeuwenberg* 7106 (BR, K, P, WAG). DEMOCRATIC REPUBLIC OF THE CONGO. Eala, *Corbisier* 1266 (FHO, K, P, WAG); Kiri, Lac Leopold, *Goossens* 6208 (BR); Madimba, Mpese, *Germain* 2067 (P, WAG). GABON. **Haut-Ogooué:** Km 23 Moanda–Franceville rd., *Breteler* 6275 (BR, MO, P, WAG). **Ogooué-Lolo:** Lastoursville, Boucimbi, *Le Testu* 8642 (BM, MO, P). GHANA. Hahoe, Togo Plateau FR, *St. Clair-Thompson* 3586 (E, FHO, MO). GUINEA [GUINEA-CONAKRY]. Friguiaqbé, Mayou-Dowie, *Chillou* 800 (MO, P); Mt. Nimba, *Schnell* 1123 (P). IVORY COAST [CÔTE D'IVOIRE]. Aplati, Boudoukou, *Aubréville* 733 (P); near Grand Bassam, Aboisso, *Breteler* 5974 (MO, P, WAG, WU). LIBERIA. 5 mi. Monrovia, Monrovia–Bopulu rd., *Van Meer* 121 (MO, WAG); Sinoe to port, *Jansen* 1119 (MO, WAG). MALI. Ngolokounadougou, Farako, *Raynal* 21012 (MO, P). NIGERIA. Akpaka Reserve, Onitsha, *Okeke FHI* 38440 (FHO, P, WAG); Eket, Aron–Eket rd., *Talbot* 3005 (BM); Gongola, Mambilla, Akwaijantan, *Chapman* 5247 (FHO, K). REPUBLIC OF THE CONGO. Brazzaville, *Chevalier* 11206 (P); La Lifoula, *de Néré* 1355 (P, WAG); Stanley Pool, *Schlechter* 12549 (BR, G, G-DC, L, P). SENEGAL. s. loc., *Perrottet* 413 (G-DC). SIERRA LEONE. Mt. Loma, *Jaeger* 7688 (G, WAG); Sherbro Island, *Hunter* 28 (BM). TOGO. Kloto, *Pisch* 7692 (MO, WAG). ZAMBIA. Mwinilunga, *White* 3311 (BM, BR, FHO, K, WAG).

51. *Gaertnera pauciflora* Malcomber & A. P. Davis, *Monogr. Syst. Bot. Missouri Bot. Gard.* 104: 392, figs. 5, 7. 2005. TYPE: Madagascar. Antsiranana: Marojejy Nature Reserve, 1300–1500 m, 19 Sep. 1997, *S. T. Malcomber* 2781 (holotype, MO-5714904!; isotypes, A!, BR!, G!, K!, LE!, MAL!, MAU!, MO-5714903!, P!, PRE!, TEF!, WAG!).

Trees or shrubs, 1.5–6 m tall; *branches* flattened to terete, glabrous, 1–3 mm diam., with bark becoming gray-white; internodes 0.4–2.6 cm, smooth or with 2 low longitudinal ridges. *Leaf* blades 1–3 × 0.4–1.5 cm, elliptic to elliptic-oblong or oblanceolate, apex shortly cuspidate or acute, base acute to usually cuneate, drying chartaceous, glabrous; secondary veins visible and flat to prominulous abaxially, 4 to 6 pairs; domatia absent or present; petioles 1.5–3 mm. *Stipules* calyptrate, glabrous, drying membranous, caducous, tube 7–21 mm, with ribs 4, narrowly winged only beneath petiole, apex with 1 or 2 incisions, lobes 2 or 4, ca. 0.5 mm, deltoid to filiform. *Inflorescences* reduced to 1 flower or 2-flowered and fasciculate, terminal on axillary branches or axillary, glabrous; peduncle 2.5–9.1 mm, often articulated in upper half; bracteoles elliptic to ovate, 1–4 mm. *Flowers* 4(5)-merous, heterodistylous. *Long-styled flowers:* calyx cup-shaped, 1–2 mm wide, glabrous, truncate or lobes 0.2–0.4 mm, broadly triangular; corolla white, clavate in bud, when open salverform, outside glabrous, tube 4–7.5 mm, 2.5–3 mm diam., inside glabrous, lobes 6–8 mm, ligulate to linear, acute; anthers included, filaments inserted in lower third of corolla tube, 0.2–1 mm; style 5–6 mm, glabrous, stigmas 0.5–1 mm. *Short-styled flowers:* similar to long styled except calyx 2.2–2.8 mm wide, lobes 0.1–0.3 mm; corolla tube 5–7.5 mm, 2.5–3 mm diam., lobes 6–7 mm; filaments 1.5–2.5 mm; style 1.8–2.5 mm, stigmas 0.5–1.2 mm. *Drupe*s violet-black, subglobose to didymous, 6–7 × 5–7.5 mm; pyrenes spherical or hemispherical, ± rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is known from the provinces of Antsiranana and Fianarantsoa. Here, it is found in humid evergreen forests on metamorphic and igneous rocks at elevations of 750–1800 m.

Phenology. This species has been collected with flowers January through March and September through December, and with fruits January through March and October through December.

Discussion. *Gaertnera pauciflora* can be separated from the other few-flowered *Gaertnera* species in Madagascar by its smooth or only slightly ridged internodes, lack of pubescence, calyptrate stipules, and subtruncate to denticulate calyx. Malcomber and Davis (2005) considered the conservation status of this species to be Endangered (IUCN, 2001).

Representative specimens examined. MADAGASCAR. **Antsiranana:** E of Andapa, Marojejy Nature Reserve (RNI #12), above camp 3 summit trail, *Malcomber* 2779 (MO,

TEF), 2780 (MO, TEF). **Fianarantsoa:** Ifanadiana–Tolongoina, Mangalahelatra, Namorona River, *Capuron SF* 23220 (P).

- 52. *Gaertnera pendula*** Bojer, Hortus Maurit. 217. 1837. *Sykesia pendula* (Bojer) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Mauritius. Montagne de Pouce, *W. Bojer s.n.* (holotype, P not located; isotype, G-DC!).

Gaertnera lanceolata Bouton ex A. DC., Prodr. 9: 33. 1845, non *Gaertnera lanceolata* Ridl., 1915. TYPE: Mauritius. La Nouvelle Decouverte, *L. S. Bouton s.n.* (holotype, G-DC!; isotype, K!).

Gaertnera oxyphylla Drake, Bull. Soc. Bot. France 45: 354. 1899, hom. illeg., non *Gaertnera oxyphylla* Benth., 1857. TYPE: Madagascar. s. loc., *L. A. Chapelier s.n.* (holotype, P!).

Trees or shrubs, 1.5–4.5 m tall; *branches* flattened to terete, glabrous, 2–4 mm diam.; internodes 0.8–8 cm, smooth. *Leaf* blades 4.5–17 × 2–8 cm, elliptic to ovate or oblanceolate, apex shortly cuspidate or acuminate, base acute to obtuse or rounded, drying chartaceous to subcoriaceous, glabrous; secondary veins prominulous abaxially, 5 to 10 pairs; domatia absent or present, often crypt-type; petioles 3–45 mm. *Stipules* tubular, glabrous, drying chartaceous, caducous or quickly deciduous through fragmentation, tube 18–20 mm, with ribs 4, narrowly winged, arising below petiole and extending to lobes, apex with 1 or 2 incisions, marcescent, lobes 4, 1–3.3 mm, deltoid or filiform. *Inflorescences* cymose, many-flowered, terminal on flexuous axillary branches, glabrous or puberulent; peduncle 3.5–9(–13) cm, flexuous; branched portion corymbiform, 1.8–3.5 × 1.5–3.3 cm, branched to 2 to 3 orders, lax to somewhat congested; bracts trifid, 3–12 mm; bracteoles triangular, 1–2 mm; pedicels absent or to 1.5 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx campanulate, 1.5–3 mm wide, puberulent to glabrous outside, glabrous inside, lobes 1.5–3.5 mm, narrowly triangular or oblong-spatulate; corolla white or pale blue, clavate in bud, when open salverform, outside glabrous, tube 16–24 mm, 2–3.5 mm diam., inside glabrous, lobes 8–9 mm, ligulate or elliptic-oblong, acute; anthers included, filaments inserted in upper third of corolla tube, to 0.5 mm; style 18–19 mm, glabrous, stigmas 2.5–3 mm. *Short-styled flowers*: similar to long styled except calyx sparsely pubescent outside; corolla tube 20–25 mm, 3.5–4 mm diam., lobes 8–10 mm, ligulate or ovate-oblong; anthers shortly exerted, filaments 0.5–1 mm; style 9–10 mm, stigmas 3.5–3.7 mm. *Drupe*s black (Bojer, 1837) or violet-black, ellipsoid or fusiform, 20–25 × ca. 10 mm; pyrenes plano-convex, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Mauritius and may also grow in Madagascar, but that report is based on an old, poorly documented specimen and seems doubtful. On Mauritius, this species is found in wet to very wet forests at elevations of 50–650 m.

Phenology. This species has been collected with flowers in January, February, and October through December, and with fruits in June.

Discussion. The collections of *Gaertnera pendula* attributed to Madagascar appear to have inaccurate labels. This species can be recognized by its pendulous inflorescences borne at the ends of long flexuous branches, white or pale blue flowers, and ellipsoid or fusiform fruits. This is the only *Gaertnera* species reported to have blue flowers.

Representative specimens examined. MADAGASCAR. s. loc., *L. S. Bouton s.n.* (K). MAURITIUS. Mt. Cocotte, *Coode* 4824 (K), *Page* 226 (MAU); Mt. Pouce, *Bojer* 68 (W); Mt. Savanne, *Friedmann* 2984 (P); Black River Gorges National Park, *Malcomber* 2933 (MO), 2936 (MO); in Pidgeon wood opposite Les Mares, *Page* 94 (MAU).

- 53. *Gaertnera phanerophlebia*** Baker, J. Linn. Soc., Bot. 21: 425. 1885. *Sykesia phanerophlebia* (Baker) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Madagascar. Central Madagascar, *R. Baron* 2982 (lectotype, designated here, K!; isotypes, BM!, P!). Figure 11G–M.

Gaertnera crinita Drake, in Grandid., Hist. Phys. Madagascar 36(6), Atlas 4: t. 432. 1897 [1898], syn. nov. TYPE: Madagascar. [Île] Sainte Marie, 1850 (fl.), *L.-H. Boivin* 1780 (lectotype, designated here, P!; isotype, MO!).

Shrubs and trees, 3–8 m tall; *branches* flattened to terete, pilose to hirsute (glabrous) with indumentum drying red-brown, 1.5–5 mm diam.; internodes 1.7–8.5 cm, smooth. *Leaf* blades 2.5–12.5 × 1–3.5 cm, elliptic-oblong to oblanceolate, apex acute to acuminate, base obtuse to truncate, drying chartaceous, adaxially glabrous or densely strigose on costa and sometimes secondary veins and occasionally sparsely hispid on blade, abaxially densely strigose to hirsute (glabrous) on principal veins to throughout; secondary veins prominulous abaxially, 6 to 14 pairs; domatia absent; petioles 1–7 mm. *Stipules* calyptrate, densely hirsute or strigose (glabrous), drying membranous, caducous, tube 11–30 mm, without ribs, with narrow wings only developed below petiole, apex with 1 or 2 incisions, marcescent, lobes 2, 0.5–2 mm, deltate. *Inflorescences* subcapitate to congested-cymose, many-flowered, terminal on principal and/or axillary branches, densely pilose to strigose (glabrous), sessile or peduncle to 4.3 cm; branched portion subglobose or corymbiform, 0.7–4.5 × 1–8.5 cm, branched to 2 to

4 orders, congested; bracts deltate to linear, 4–20 mm; bracteoles 1–2 mm; pedicels absent or to 3 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 1.5–4.2 mm wide, outside glabrous or pilosulose to strigose, glabrous inside, lobes equal to unequal, 2–5 mm, linear to narrowly triangular; corolla white, clavate in bud, when open salverform, outside pilose to pilosulose (glabrous), tube 9.5–17 mm, 2–4.5 mm diam., inside villous at ca. middle or in upper third, lobes 1.5–6 mm, triangular or ligulate, acute; anthers included, filaments inserted at ca. middle of corolla tube, ca. 0.4 mm; style 9.5–16.5 mm, glabrous, stigmas 1.4–3 mm. *Short-styled flowers*: similar to long styled except calyx 1.5–3.5 mm wide, outside pubescent to pilose or glabrous, lobes 5–13.9 mm, triangular to linear; corolla tube 1.8–4.5 mm diam., lobes 1.7–5 mm, filaments inserted in upper third of corolla tube, 1.2–3.5 mm; style 4.4–7.2 mm, stigmas 1.5–3.6 mm. *Drupe*s violet-black, subglobose or didymous, 6–9 × 6–9 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is known widely through the northeastern region. Here, it is frequent in wet forests at elevations of 50–1650 m.

Phenology. This species has been collected with flowers January through March and June through December, and with fruits January through March and August through December.

Discussion. *Gaertnera phanerophlebia* is a distinctive species that can be recognized by its subglobose to corymbiform, congested-cymose to subcapitate inflorescences, well-developed narrow calyx lobes, reddish brown to chestnut drying color, and usually dense indumentum. Occasionally, plants are glabrous but otherwise match this species (e.g., *McPherson & van der Werff* 16360, MO) and are included here; such variation in pubescence is found in some other species of Rubiaceae. This species is similar to *G. hispida*; see additional comments under that section of this paper.

The protologue of *Gaertnera crinita* does not discuss the comparison or contrast of this species with the similar species *G. phanerophlebia*, so it is unknown if Grandidier was familiar with *G. phanerophlebia*. The figure in the protologue of *G. crinita* shows both flowers and fruits, and matches plants included here in *G. phanerophlebia* in all details; accordingly, these names are synonymized here. No specimen was mentioned in *G. crinita*'s protologue, but several specimens are annotated with this name at P. These generally match the figure and are all identified as

Boivin 1780 with the flowering collections recorded as collected in 1850 and the fruiting collections in 1849. No other collections were found annotated with this name. Because the fruits of most *Gaertnera* species are similar, the flowering specimens that show all the features that distinguish this species and are dated 1850 are chosen as the lectotype. The specimen at P is chosen as the lectotype because the author of the name worked at that institution, and the specimen deposited at MO was distributed only recently.

Two syntypes were cited in the protologue of *Gaertnera phanerophlebia*, *R. Baron* 2372 (K!, P!) and *R. Baron* 2982 (BM!, K!, P!). The latter is selected here as lectotype because it is a more complete and exemplary specimen with more duplicates. The specimen at K is chosen as the lectotype because the author of the name worked at that institution.

Gaertnera phanerophlebia apparently hybridizes with some other *Gaertnera* species. In particular, one specimen, *P. J. Rakotomalaza et al.* 2068 (Madagascar, Majunga, 1200 m, MO), seems to represent a hybrid between *G. phanerophlebia* and either *G. humblotii* or *G. raphaelii*.

Representative specimens examined. MADAGASCAR. **Antsiranana:** Manongarivo Nature Reserve, Ansatroto, *Gautier & Chatelain* 2817 (G, MO, P); Ambodisakoano, *G. McPherson & van der Werff* 16360 (MO, TAN); Massif Bekolosy, *Gachet* SF 7531 (TEF); Marojejy Nature Reserve, *Humbert* 22283 (P), 31467 (MO, P), 31669 (MO, P), *Miller & Randrianasolo* 4488 (MO). **Toamasina:** Analalva, W of Foulpointe, *Capuron* SF 23845 (P); Anjanaharimbe-Sud Reserve, Antsavokabe, *Ravelonarivo* 903 (MO, P, TAN); Didy, Brickaville, *Cours* 4893 (P); Île Saint-Marie, *Boivin* 1780 (G-DC, MO, P); Vohimarongitra Reserve, *Rakotoniaina* RN 2448 (MO); Zahamena National Park, *Humbert* 17618 (P), *Botoalina* RN 3192 (MO, TAN).

54. *Gaertnera phyllosepala* Baker, J. Linn. Soc., Bot. 20: 207. 1883. *Sykesia phyllosepala* (Baker) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Madagascar. Central Madagascar, *R. Baron* 1920 (holotype, K!; isotype, P!). Figure 14A–F.

Trees, 1.5–8 m tall; branches flattened to terete or subquadrate, when young densely hispidulous to strigose or pilose with indumentum drying yellow to gray, when older, trichomes often breaking off leaving prominent persistent basal portions, 3–7 mm diam.; internodes 2–8.5 cm, smooth. *Leaf* blades 6.5–20.5 × 2.5–7.5 cm, lanceolate to elliptic, oblanceolate, or elliptic-oblong, apex shortly acuminate, base rounded to truncate or cordulate, drying chartaceous, adaxially glabrous except pilosulose to pilose on costa and sometimes secondary veins, abaxially pilose or pilosulose with indumentum denser on principal veins; secondary veins prominent abaxially, 9 to 12 pairs; domatia absent; petioles 3–11 mm. *Stipules*

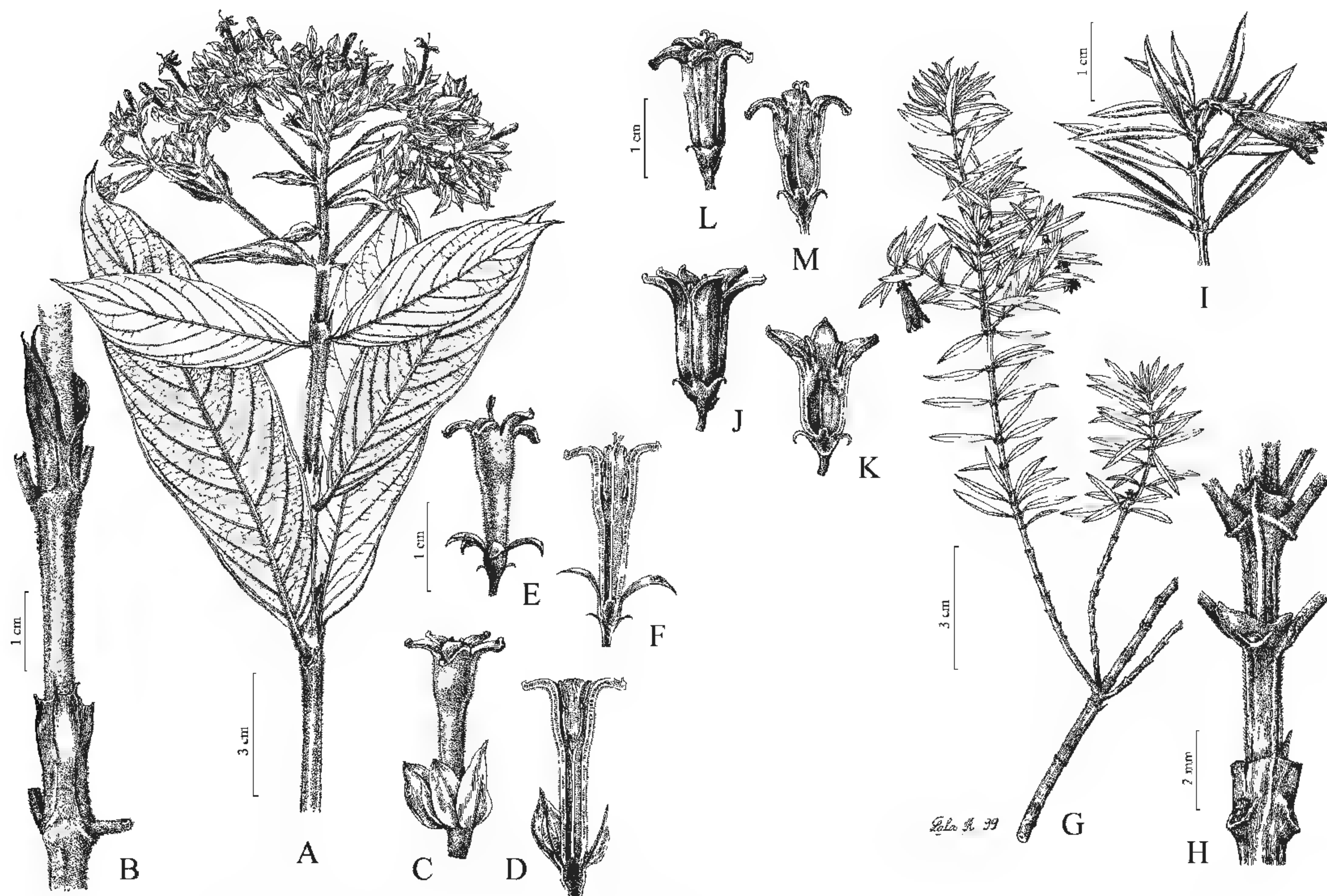


Figure 14. A–F. *Gaertnera phyllosepala* Baker. —A. Flowering branch. —B. Portion of stem with petiole bases and stipules. —C. Short-styled flower. —D. Short-styled flower in cross section. —E. Long-styled flower. —F. Long-styled flower in cross section. G–M. *Gaertnera ternifolia* Thwaites. —G. Flowering branch. —H. Portion of stem with petiole bases and stipules. —I. Portion of flowering branch. —J. Short-styled flower. —K. Short-styled flower in cross section. —L. Long-styled flower. —M. Long-styled flower in cross section. C–F to same 1-cm scale; J–M to same 1-cm scale. A–F based on *Moise* 6; G–M based on *Malcomber* 2767.

tubular, pilose to hirsute or strigose, drying chartaceous, persistent at least on distalmost several nodes, tube 8–21 mm, with ribs 4, narrowly winged, arising below petiole and sometimes extending to lobes; apex with 1 or 2 incisions, marcescent, lobes 4, 2–6 mm, deltate to linear. *Inflorescences* cymose, many-flowered, terminal on axillary branches, pilosulose to pilose; peduncle 1.8–8 cm; branched portion corymbiform, 4.5–14 × 3–19 cm, branched to 3 to 5 orders, lax or somewhat congested; bracts lanceolate to elliptic or ovate, 5–30 mm, white, sometimes glabrous; bracteoles 5–10 mm, white; pedicels absent or to 3 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped or campanulate, 2.4–3 mm wide, outside densely pilosulose or puberulent, glabrous inside, lobes ca. equal in size or 1 lobe larger, 5–9.4 mm, narrowly lanceolate to elliptic or ovate, white; corolla white, clavate in bud, when open infundibuliform or salverform, outside densely pilosulose or puberulent, tube 14–16 mm, 1.5–4 mm diam., inside glabrous, lobes 4–6 mm, triangular to ligulate, acute; anthers included, filaments inserted in upper third of corolla tube, 0.3–0.7 mm; style 14–

16.5 mm, glabrous, stigmas 1.5–2.5 mm. *Short-styled flowers*: similar to long styled except calyx 2–3 mm wide, lobes 6.5–13 mm, lanceolate or elliptic; corolla tube 15–22 mm, 1.5–4.5 mm diam., lobes 2.5–6 mm, acute; filaments 2–3.5 mm; style 8.5–11 mm, stigmas 2.5–3.5 mm. *Drupes* violet-black, subglobose or didymous, 6–7 × 7–8 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is known from the provinces of Antsiranana, Fianarantsoa, and Toamasina. Here, it is found in humid forests at elevations of 0–1200 m.

Phenology. This species has been collected with flowers in January, February, and October through December, and with fruits January through May and in December.

Discussion. *Gaertnera phyllosepala* is an attractive and commonly encountered species with showy, well-developed white calyx lobes and bracts. This species is similar to *G. phyllostachya*; *G. phyllosepala* can be recognized by its densely hispidulous to strigose or

pilose branches, tubular stipules, shorter calyx lobes and bracteoles, 5–10 mm long, and regularly lobed calyx limbs with the lobes rounded to obtuse or shortly acuminate, versus glabrous to puberulent branches, calyptrate stipules, calyx lobes and bracteoles 6–16 mm long, and truncate or 1- to 3-lobed calyx limbs with the lobes sharply acute in *G. phyllostachya*.

Representative specimens examined. MADAGASCAR. **Antsiranana:** Antalaha, Ampanavoana, *Ranjokiny RN-10845* (P). **Fianarantsoa:** Anosy-Manakara, *Unknown Collector SF 13604* (P, TEF). **Toamasina:** Brickaville, *Croat 32613* (MO, TAN), *D'Arcy 15273* (MO, P); Mananara-Nord National Park, *Malcomber 2910* (MO, TEF), *Raharimalala 193* (P); Masoala National Park, Andranobe, *Malcomber 2814* (MO, TEF), *Schatz 1348* (MO, P, TAN, WAG), *3080* (MO, P, TAN), *Van Nek 2107* (TAN), *Zjhra 133* (MO, P, TAN); Soanierana-Ivongo, Fenerive, *Unknown Collector SF 1058* (P, TAN, TEF); Zahamena (RNI 3), *Botoalina RN 607* (MO), *Decary 16786* (P).

55. *Gaertnera phyllostachya* Baker, J. Linn. Soc., Bot. 21: 425. 1885. *Sykesia phyllostachya* (Baker) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Madagascar. s. loc., *R. Baron 2327* (lectotype, designated here, K!).

Trees, 5–10 m tall; *branches* terete to flattened or subquadrangular, when young glabrous or puberulent at least near nodes with indumentum drying yellow, becoming glabrescent, 2–4 mm diam.; internodes 2–7 cm, smooth. *Leaf* blades 3.5–15(–17) × 1–5.5(–8) cm, elliptic to oblanceolate or oblong, apex obtuse then shortly cuspidate or acuminate, base attenuate or cuneate (truncate), drying chartaceous to subcoriaceous, glabrous or pilosulose along midrib abaxially; secondary veins prominulous abaxially, 5 to 7(to 12) pairs; domatia absent or present, pilosulose to deep crypt-type; petioles 4–8 mm. *Stipules* calyptrate, glabrous to densely pilosulose or puberulent, drying membranous, caducous, deciduous through fragmentation, or occasionally persistent, tube 10–35(–55) mm, with ribs 4, narrowly winged, arising beneath petiole and sometimes extending to apex, apex with 1 incision, lobes 1 or 2, 1–2 mm, deltate to linear. *Inflorescences* cymose, many-flowered, terminal on axillary branches, puberulent; peduncle 1.4–4.5 cm; branched portion corymbiform, 2–10(–20) × 2.7–18.5 cm, branched to 3 to 4 orders, lax or somewhat congested; bracts lanceolate to ovate or trifid, 15–20 mm, white, adaxially glabrous, abaxially glabrous or puberulent; bracteoles lanceolate to ovate, 8–16 mm, white; pedicels absent or to 2.3 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers:* calyx campanulate, 1–2.5 mm wide, outside puberulent, glabrous inside, truncate or some flowers with 1 to 3 lobes, lobes equal to unequal, 6–15 mm, elliptic to narrowly elliptic or elliptic-oblong, white; corolla

white, clavate in bud, when open salverform or infundibuliform, outside glabrous, tube 9–11.5 mm, 1–2.5 mm diam., inside glabrous, lobes 3.5–4 mm, ligulate or elliptic-oblong, acute; anthers included, filaments inserted in upper third of corolla tube, 0.5–1 mm; style 11–13 mm, glabrous, stigmas 0.7–2 mm. *Short-styled flowers:* similar to long styled except calyx 0.7–2.5 mm; corolla tube 10–16 mm, 2–4.5 mm diam., lobes 3–4 mm; anthers shortly exerted, 2.5–3 mm; style 9–10 mm, stigmas 3–3.5 mm. *Drupe*s violet-black or blue, globose, 4–8 × 5–7 mm; pyrenes spherical or hemispherical, ± rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is known from the provinces of Antananarivo, Antsiranana, Fianarantsoa, Mahajanga, and Toamasina. Here, it grows in humid forests at elevations of 100–1200 m.

Phenology. This species has been collected with flowers in January, February, November, and December, and with fruits January through May and in November and December.

Discussion. The calyx of *Gaertnera phyllostachya* appears at first glance to be regularly lobed, but the top of the limb is actually truncate or denticulate in most flowers; in a minority of the flowers it is truncate with one to three well-developed lobes. The flowers are also regularly subtended by two showy bracts that are fused to the base of the calyx and seem to have been confused with calyx lobes by some authors, but these clearly arise well below the top of the calyx limb. Similarly, though, smaller bracts are borne at the top of the pedicel in several other species of *Gaertnera*, thus these structures are interpreted here as bracts. This species is morphologically quite variable, from slender plants with relatively small leaves and deciduous stipules (e.g., *Miller & Miller 3821* [MO]; *Rasoavimbahoka et al. 69* [MO]) to robust plants with relatively large leaves and larger persistent stipules (e.g., *Schatz & Miller 2432* [MO]; *Nicoll 202* [MO]). The presence, number, and form of the leaf domatia also vary notably, apparently without correlation to these other characters.

This species is largely restricted to eastern forests of Madagascar at 100–1200 m altitude; however, it has also been collected in western forests near Mahajunga, at an elevation not recorded (*D'Alleizette 1477*, P). *Gaertnera phyllostachya* is similar to *G. phyllosepala*; see additional comments under that species.

Three syntypes were cited in the protologue, *R. Baron 2327* (K!), *R. Baron 2683* (K), and *L. Humblot 510* (K!, P!). The first specimen is selected here as

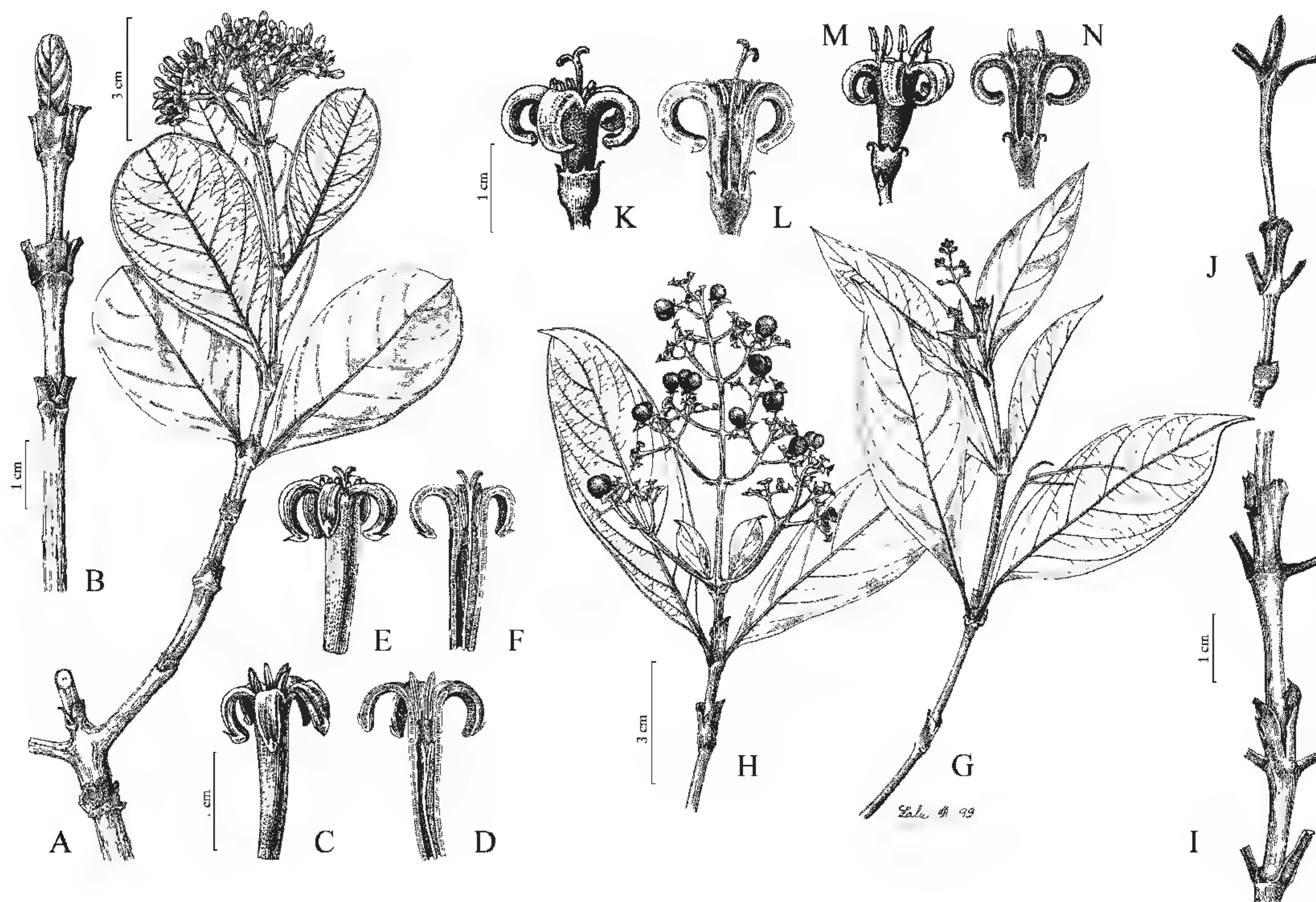


Figure 15. A–F. *Gaertnera psychotrioides* (DC.) Baker. —A. Flowering branch. —B. Portion of stem with stipules and stem apex with young leaves. —C. Short-styled flower. —D. Short-styled flower in cross section. —E. Long-styled flower. —F. Long-styled flower in cross section. G–N. *Gaertnera vaginans* (DC.) Merr. —G. Flowering branch. —H. Fruiting branch. —I. Portion of stem with petiole bases and stipules. —J. Portion of stem with petiole bases, stipules, and stem apex. —K. Long-styled flower. —L. Long-styled flower in cross section. —M. Short-styled flower. —N. Short-styled flower in cross section. C–F to same 1-cm scale; G, H to same 3-cm scale; I, J to same 1-cm scale; K–N to same 1-cm scale. A–F based on *Malcomber* 2931; G, I–N based on *Malcomber* 2760; H based on *Malcomber* 2761.

lectotype because it is a more complete and exemplary specimen.

Representative specimens examined. MADAGASCAR. **Antananarivo:** Ankeramadrinka, *Scott-Elliot* 1774 (K). **Antsiranana:** Marojejy Nature Reserve, *Miller* 3918 (MO, P), *Randrianasolo* 70 (MO, TAN), *Humbert* 22106 (P). **Fianarantsoa:** Andringitra Nature Reserve, *Lewis* 786 (MO, P); Ranomafana National Park, *Nicoll* 202 (MO, P, TAN), *Malcomber* 2589 (K, MO, P, TAN), 2866 (MO), *Overdorff* 24 (MO), *Schatz & Miller* 2432 (MO, P, WAG). **Mahajanga:** near Mahajanga, *D'Alleizette* 1477 (P). **Toamasina:** Ambo-divoangy, *Cours* 1843 (P, TAN); Analamazaotra, *Capuron* SF 568 (P, TEF), *C. D'Alleizette* s.n. (P), *Perrier de la Bâthie* 4014 (MO, P); Andasibe (Perinet), *Cours* 4414 (P), 830 m, *Croat* 32246 (MO, TAN, WAG), *Dorr* 3080 (MO, P, WAG), *Evrard* 11243 (BR), *Lowry* 4262 (MO, P, TAN, WAG), *Miller & Miller* 3821 (MO, P, TAN); Betampona Nature Reserve, Vohimarangitra, *Cours* 2543 (P); Didy, Brickaville, *Cours* 4804 (P); Masoala Peninsula, *Malcomber* 2733 (MO), 2821 (MO); Moramanga, *Decary* 15297 (MO, P), 6907 (P), 7085 (P), *Rabevohitra* 2578 (TEF), 6907 (P), 7085 (P); Zahamena Nature Reserve, *Ramanatsoavina* RN 2814 (MO, TAN).

56. *Gaertnera psychotrioides* (DC.) Baker, Fl. Mauritius 231. 1877. Basionym: *Chassalia psychotrioides* DC., Prodr. 4: 531. 1830. *Sykesia*

psychotrioides (DC.) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Mauritius. s. loc., *F. W. Sieber* 57 (holotype, G!; isotypes, E!, K!, MO!, OXF!, P!, W!, WU!). Figure 15A–F.

Chassalia coffeoides DC., Prodr. 4, 531. 1830. *Coffea chasaloides* D. Dietr., Syn. Pl. 1: 777. 1839, nom. superfl. illeg. TYPE: Mauritius. s. loc., *F. W. Sieber* 335 (holotype, G-DC not located).

Gaertnera bifida Bojer, Hortus Maurit. 217. 1837. TYPE: Mauritius. Quartier Militaire and Moka, *W. Bojer* s.n. (holotype, P not located; isotype, BM!).

Gaertnera parviflora Bojer, Hortus Maurit. 217. 1837. TYPE: Mauritius. Savanne and Trois Ilots, *W. Bojer* s.n. (holotype, P not located).

Gaertnera quadriseta A. DC., Prodr. 9: 34. 1845, syn. nov. TYPE: Mauritius. s. loc., *W. Bojer* s.n. (holotype, G-DC microfiche!).

Gaertnera quadriseta var. α *brevipes* A. DC., Prodr. 9: 34. 1845, syn. nov. TYPE: Mauritius. s. loc., *F. W. Sieber* 272 (holotype, G-DC!; isotypes, BM!, E!).

Gaertnera quadriseta var. β *platypoda* A. DC., Prodr. 9: 34. 1845, syn. nov. TYPE: Mauritius. s. loc., *W. Bojer* s.n. (syntypes, G-DC microfiche!).

Gaertnera quadriseta var. γ *hebepoda* A. DC., Prodr. 9: 34. 1845, syn. nov. TYPE: Mauritius. s. loc., *F. W. Sieber* 332 (holotype, G-DC!; isotypes, E!, P!).

Gaertnera quadriseta var. *δ petiolaris* A. DC., Prodr. 9: 34. 1845, syn. nov. TYPE: "Ile de France ou Bourbon," s. coll., "ex Paris 1821" (holotype, G-DC!).

Gaertnera truncata A. DC., Prodr. 9: 34. 1845, syn. nov. TYPE: Mauritius. s. loc., *F. W. Sieber 54* (holotype, G-DC!; isotypes, E!, G!, K!, L!, P!, W!).

Trees or shrubs, (0.6–)1.8–12 m tall; *branches* terete, glabrous, 2–8 mm diam.; internodes 1–5.5 cm, smooth. *Leaf* blades 2.5–17.5 × 1.1–8.3 cm, oblanceolate to elliptic-oblong, elliptic-lanceolate, or elliptic, apex rounded or acute to acuminate, base cuneate to acute, drying coriaceous, glabrous; secondary veins visible and flat to prominent abaxially, 5 to 8 pairs; domatia present; petioles 5–35 mm. *Stipules* tubular, glabrous or puberulent to pubescent, drying chartaceous, persistent or sometimes fragmenting, tube 2–12 mm, with ribs 4, narrowly winged, arising beneath petiole, angling to meet in middle of interpetiolar side and sometimes extending to lobes, apex entire or with 2 incisions, marcescent, lobes 4, 1–5 mm, linear. *Inflorescences* cymose, many-flowered, terminal on axillary branches, puberulent or glabrous; peduncle 3.5–6 cm; branched portion corymbiform, 1.5–10 × 3–15 cm, branched to 3 to 4 orders, lax or usually rather congested; bracts deltate to linear or trifid, 3–9 mm; bracteoles triangular to ovate, 1–2 mm; pedicels absent or to 1.5 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 2–4 mm wide, glabrous, truncate or lobes to 0.2 mm, triangular; corolla white, clavate in bud, when open salverform, outside puberulent or glabrous, tube 10–12.5 mm, 2–2.5 mm diam., inside villous in upper third, lobes 4.5–5.5 mm, ligulate to linear, acute; anthers shortly exserted, filaments inserted in upper third of corolla tube, 1–1.5 mm; style 15–17 mm, glabrous (pubescent near apex), stigmas 1–1.5 mm. *Short-styled flowers*: similar to long styled except corolla tube 11–14 mm, 2.5–3 mm diam., lobes 4–5 mm; filaments ca. 2 mm; style 9–10 mm, stigmas ca. 1 mm. *Drupes* violet-black or blue, ellipsoid, 7–10 × 6–8 mm; pyrenes plano-convex, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Mauritius, where it is found in wet evergreen forests and in the heathlike vegetation on lava flows ("groundwater laterite"), at elevations of 200–812 m.

Phenology. This species has been collected with flowers in January, May, November, and December, and with fruits February through June.

Discussion. *Gaertnera psychotrioides* is frequently encountered within the forests of Mauritius. Unlike the similar species *G. hirtiflora*, *G. psychotrioides* lacks setae at the top of the stipule tube and has

externally glabrous corollas. *Gaertnera psychotrioides* might also be confused with *G. edentata*, but can be distinguished by its lax corymbiform inflorescences 3–15 cm wide and its smaller flowers.

Verdcourt (1989) separated *Gaertnera quadriseta*, noting that it is imperfectly known and distinguishing it by its corolla tube ca. 3 mm in diameter, versus what he characterized only as a narrow corolla tube in *G. psychotrioides*, and also in having relatively larger though overlapping conditions of several characters such as leaves and bracts. According to the species circumscription used here, these are not distinct taxa and are not separated here. Verdcourt (1989) also separated *G. truncata*, noting that this species was imperfectly known and separating it by its "truncate to very lightly lobed" calyx, in contrast to subtruncate or with lobes 0.5–0.8 mm long in *G. psychotrioides* of Verdcourt's description. The characters of *G. truncata* thus fall within the variation found in *G. psychotrioides*, and this species is not separated here.

Representative specimens examined. MAURITIUS. Bel Ombre, *D'Argent MAU 22454* (MAU), *Lorence 2209* (MO), *4449* (MO), *4490* (MO); Mt. Le Pouce, *Bernardi 14714* (BM, G, K, MO, P), *G. Gardner s.n.* (K), *Lorence 1956* (MO), *Tirvengadam 379/29* (MAU); Black River Gorges National Park, *Malcomber 2938* (MO), *2939* (MO), *Bernardi 14778* (G, P); Macabé, *Bernardi 14714* (K), *14794B* (K), *Vaughan MAU 13761* (MAU), *Lorence M 281* (MO), *1495* (MAU, MO), *2125* (MO), *Malcomber 2946* (MO), *2947* (MO), *Tirvengadam 396/46* (MAU); Plaine Champagne, *Lorence 1541* (MAU, MO), *Coode 4765* (K, MAU, P), *Malcomber 2930* (MO), *2931* (MO).

57. *Gaertnera ramosa* Ridl., J. Linn. Soc., Bot. 38: 317. 1908. TYPE: Malaysia. Gunong Tahan, 3 July 1905, *H. G. Robinson & L. Wray, Jr. 5488* (holotype, SING!; isotypes, BM!, K!, SING!).

Gaertnera pedicellata Ridl., J. Straits Branch Roy. Asiat. Soc. 79: 99. 1918. TYPE: Malaysia. Selangor: Gunong Minghuan, 6 Feb. 1913, *H. G. Robinson s.n.* (holotype, K!; isotype, SING!).

Gaertnera sessiliflora Ridl., J. Straits Branch Roy. Asiat. Soc. 79: 99. 1918. TYPE: Malaysia. *H. G. Robinson s.n.* (holotype, K!; isotype, SING!).

Gaertnera caudata Ridl., J. Fed. Malay States Mus. 6: 51. 1915. *Gaertnera acuminata* var. *montana* Ridl., Fl. Malay Penins. 2: 428. 1923. TYPE: Malaysia. Perak: Gunong Kerbau, 14 Mar. 1913, *H. G. Robinson s.n.* (holotype, K!).

Trees or shrubs, 3–5(–8) m tall; *branches* terete to flattened, glabrous, 1–4 mm diam.; internodes 0.6–7.5 cm, smooth. *Leaf* blades 3–14.5 × 0.8–5 cm, elliptic-lanceolate to elliptic, oblanceolate, or linear-lanceolate, apex cuspidate to acuminate, base acute to cuneate, drying chartaceous, glabrous; secondary veins distinct abaxially, 3 to 9 pairs; domatia absent or present, hirtellous and sometimes foveolate; petioles 3–25 mm. *Stipules* tubular, glabrous, drying

membranous, marcescent or caducous, tube 7–15 mm, with ribs 4, narrowly winged, arising below petiole and sometimes extending to lobes, apex usually entire or with 1 incision, marcescent, lobes 4, up to 2.5 mm, deltate to filiform. *Inflorescences* cymose, several-flowered, terminal on axillary branches, glabrous, sessile or peduncle to 4.5 cm; branched portion corymbiform, 1–7.5 × 1–6 cm, branched to 2 to 3 orders, lax (congested in apical part); bracts linear or deltate, 1–5 mm; bracteoles reduced; pedicels absent or to 5 mm. *Flowers* 5-merous, unisexual. *Pistillate flowers*: calyx cup-shaped, 2.5–3.5 mm wide, glabrous, truncate or lobes to 0.8 mm, triangular; corolla white, clavate in bud, when open salverform, outside glabrous or puberulent, tube 5–10 mm, 1.5–4 mm diam., inside villous in upper third, lobes 2–4 mm, ligulate or ovate-oblong, acute; staminodia included, filaments inserted in upper third of corolla tube, ca. 0.5 mm; style 6–10 mm, glabrous, stigmas 2–2.5 mm. *Staminate flowers*: similar to pistillate except anthers shortly exserted, filaments 1–8 mm; pistillodes with style portion 4–6 mm, stigmatic portions 0.8–1.5 mm. *Drupe*s violet-black or blue, globose or didymous, 7–8 × 7–11 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in southeastern Asia, where it is known from Peninsular Malaysia at elevations of 450–2100 m and is particularly frequently encountered in the Cameron and Genting highlands. Here, it is found in humid forests at elevations of 1300–1600 m.

Phenology. This species has been collected with flowers January through April and May through December, and with fruits April through October.

Discussion. This species belongs to the *Gaertnera vaginans* complex; see also the discussion of that group for related species and their distinctions. Van Beusekom (1967) considered *G. ramosa* a synonym of *G. vaginans* subsp. *junghuhniana*. Although *G. ramosa* is phenotypically similar to some of the fewer-flowered forms of *G. junghuhniana*, it is recognized here as a separate species based on its larger, often pedicellate flowers. *Gaertnera ramosa* might be confused with *G. belumutensis*, but differs in the lax inflorescence and in not drying with an orange cast.

Representative specimens examined. MALAYSIA. **Pa-hang**: Cameron Highlands, Bukit Jasar, Wong FRI 32350 (A, K, KEP, L, SAN, SING), Henderson SING 23390 (BM, FHO, SING); Fraser's Hill, Purseglove 4227 (A, K, L); Pine Tree Hill, Nickille 4816 (K).

58. *Gaertnera raphaelii* Malcomber, sp. nov.
TYPE: Madagascar. Fianarantsoa: Ranomafana National Park, 21°13'S, 47°27'E, 900 m, Nov.

1991, S. T. Malcomber et al. 1018 (holotype, MO-4570509!; isotypes, BR!, G!, TAN!, WAG!). Figure 4G–I.

Haec species *Gaertnerae obovatae* Baker similis, sed ab ea inflorescentiae bracteis albis prominentibus atque in quoque flore lobulis calycinis uno duobusve in calycophylla alba petaloidea expansis distinguitur.

Trees or shrubs, 2–10 m tall; *branches* flattened or terete or quadrangular, glabrous, 2–4 mm diam.; internodes 1.5–4 cm, smooth. *Leaf* blades 3.2–11 (–14) × 1–4 (–5.5) cm, elliptic to oblanceolate or elliptic-oblong, apex shortly cuspidate or acuminate, base cuneate to obtuse, drying chartaceous, glabrous; secondary veins distinct, thinly prominent, 5 to 8 pairs; domatia usually present; petioles 3–11 (–14) mm. *Stipules* calyptrate, glabrous, drying membranous, caducous or quickly fragmenting, tube 11–30 (–55) mm, with ribs 4, rounded to narrowly winged, arising beneath petiole and sometimes extending to apex, apex with 1 incision, marcescent, lobes 2, 0.5–0.7 mm, deltate or linear. *Inflorescences* cymose, many-flowered, terminal on axillary branches, puberulent to glabrescent; peduncle 0.5–4 cm; branched portion corymbiform, 1.4–7.5 × 1.4–7.5 (–9) cm, branched to 3 to 4 orders, lax or sometimes congested near apex; bracts linear to ligulate or trifid, 5–15 mm, white; bracteoles triangular to ovate, 1–2.5 mm, white; pedicels absent or to 2 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped or campanulate, 1.7–2.5 mm wide, outside glabrous, with hair-ring inside, lobes unequal with 1 or 2 larger, 1–5 mm, linear to triangular or elliptic-oblong, white; corolla white, clavate with thickened abaxial appendages at apex in bud, when open salverform, outside glabrous, tube 8–10 mm, 2–3 mm diam., inside villous in upper third, lobes 2–3 mm, triangular to ligulate, acute; anthers included, filaments inserted in upper third of corolla tube, 0.3–0.5 mm; style 6–8 mm, glabrous, stigmas 1–4 mm. *Short-styled flowers*: similar to long styled except calyx 1.5–3 mm wide; corolla tube 6.5–10 mm; anthers shortly exserted, 1.5–2 mm; style 4–5 mm, stigmas 2–2.5 mm. *Drupe*s violet-black, globose or didymous, 4–8 × 5–8 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Madagascar, where it is known from the provinces of Fianarantsoa and Toliara, in the Ranomafana, Andringitra, and Andohahela Nature Reserves. Here, it is found in humid forests at elevations of 150–1150 m.

Phenology. This species has been collected with flowers September through December and with fruits January through April and in December.

Discussion. *Gaertnera raphaelii* is similar to *G. obovata*, *G. humblotii*, and *G. phyllostachya*, but can be distinguished by its elliptic unequal calyx lobes and inflorescence bracts, with only one or two enlarged calyx lobes per flower. *Gaertnera humblotii* is similar to *G. raphaelii*, in particular in the distinctive bracts and calyx lobes, but differs in its longer calyx lobes, 5–7 mm long, larger leaves, and tubular stipules. *Gaertnera raphaelii* may hybridize with *G. phanerophlebia*; see additional comments under that species.

Gaertnera raphaelii is named in honor of Malagasy botanist Raphael Rakoto, who made some of the early collections of this species from Ranomafana National Park before his untimely death in 1995.

Paratypes. MADAGASCAR. Manampanihy Valley, *Humbert* 6056 (MO, P); Sakaleona Valley, *Decary* 14342 (MO, P); *Bernardi* 11535 (K); *Nicoll* 106 (P, TAN). **Fianarantsoa:** Ambalavao, Mahazory, Vohimary, *Rakotovo* 537 (TEF); Andranomanaraka, Tolongoina, *Unknown Collector SF* 5231 (TAN); Andringitra Nature Reserve, *Lewis* 819 (MO, P), camp 1, ca. 45 km S of Ambalavao, *Lewis* 756 (MO, P), camp 2, Ivongo, Ambahatsy, *Rakotovo* 108 (MO); Anolatsiky-Tolongoina, Fort Carnot, *Unknown Collector SF* 7130 (P); Farafangana, Ankazomaneno, *Ratsirahonana F*-15372 (TEF, MO); Fort Carnot, Andrianonianaraka, *Unknown Collector SF* 5232 (TEF); Iantara, Manampatra Basin, *Humbert* 3366 (P); Ivongo, Farafangana, *Rakotovo* RN 6841 (P), RN 8509 (P); Marovaky, Ivohibe Bara, *Armand* 26 (P); Midongy-Sud, *Akondrova* SF 26415 (TEF); Ranomafana National Park, *Malcomber* 999 (BR, G, MO, TAN, WAG), Parcel 3, Talatakely, *Turk* 421 (MO), *Malcomber* 2875 (MO), 2878 (MO), *Schatz & Miller* 2425 (K, MO, P, WAG), *Nicoll* 105 (MO, TAN); Valley of Ianlara, Ivohibe-Farafangana, *Unknown Collector SF* 1458 (P, TAN, TEF), *SF* 1472 (P, TAN, TEF). **Toliara:** Andohahela Reserve, *Leeuwenberg* 14017 (WAG), *Malcomber* 1172 (MO, TAN), *Schatz & Miller* 1228 (MO, P, TAN); NW of Eminiminy, Itrotroky River, *Malcomber* 2155 (MO, P), parcel 1, Eminiminy, *Randrianampiona* 45 (MO, P); Fort Dauphin, Ivondro, *Decary* 10814 (P); Tsitongabarika, *Decary* 11018 (P).

59. *Gaertnera rosea* Thwaites ex Benth., J. Proc. Linn. Soc., Bot. 1: 111. 1857. *Sykesia rosea* (Thwaites ex Benth.) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Sri Lanka. *G. H. K. Thwaites CP* 2673 (lectotype, designated by van Beusekom, 1967 [1968]: 377, K!; isotypes, BM!, BO not seen, BR!, CGE!, G!, GH!, L!, P not seen, PDA!, W!, WU!). [SYNTYPE: Sri Lanka. *G. W. Walker s.n.* (K not seen).]

Treelets or trees, 2–5 m tall; branches terete, glabrous, 0.5–2(–3) mm diam.; internodes 0.3–4.5 cm, with 2 longitudinal ribs. Leaf blades 1–7 × 0.5–3 cm, elliptic-lanceolate, elliptic-oblong, or elliptic, apex cuspidate or acuminate, base cuneate, drying chartaceous, glabrous; secondary veins evident and flat to prominulous abaxially, 3 to 6 pairs;

domatia present, foveolate with hirtellous pubescence inside; petioles 0.5–5 mm. Stipules tubular, glabrous to densely pilosulose, drying membranous, persistent, tube 1–5 mm, with ribs 4, narrowly ridged, arising above or beneath petiole and extending onto tube, fusing into 1 rib on each interpetiolar side, these extending to lobes, apex entire, marcescent, lobes 2 and deeply bifid or 4, 1.5–5.5 mm, filiform. Inflorescences 3-flowered, congested-fasciculate to subcapitate, terminal on axillary branches, glabrous, 0.2–2.3 × 0.4–2.6 cm, sessile or peduncle to 4 cm; bracts deltate or stipuliform, 1.2–2.5 mm; bracteoles reduced; pedicels absent or to 0.6 mm. Flowers 4-merous, heterodistylous. Long-styled flowers: calyx cup-shaped, 1.5–4 mm wide, glabrous, truncate or lobes to 0.9 mm, triangular; corolla pink on tube and white on lobes, clavate in bud, when open salverform, outside glabrous, tube 12–20 mm, 1–3 mm diam., inside villous in upper third, lobes 7–10.5 mm, ligulate, acute; anthers included, filaments inserted in upper third of corolla tube, 0.2–0.5 mm; style 13–17 mm, glabrous, stigmas 2–5 mm. Short-styled flowers: similar to long styled except corolla tube 16–23 mm, 1.5–4 mm diam., lobes 5–11.5 mm; filaments 1.8–4 mm; style 6.5–9 mm, stigmas 2.5–4.5 mm. Drupes violet-black, globose or subglobose, 7–10 × 7–10 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Sri Lanka, where it can be found in humid forests at elevations of 250–1300 m.

Phenology. This species has been collected with flowers May through August and with fruits June through October.

Discussion. *Gaertnera rosea* can be recognized by its ridged internodes, inflorescences reduced to a 3-flowered, congested cyme, and 4-merous flowers with pink corolla tubes and white corolla lobes. Yellow flowers are reported on several specimens (e.g., *Kostermans* 23597); from field observations, it appears that the flowers open with a pink corolla tube and white lobes and then turn yellow as they age as in some other species of Rubiaceae.

Representative specimens examined. SRI LANKA. Galle, Kanneliya, *Waas* 1335 (K, MO, PDA). **Ratnapura Distr.:** Mannikkawatta, *Waas* 1768 (E, GH, K, L, MO, PDA).

60. *Gaertnera rotundifolia* Bojer, Hortus Maurit. 216. 1837. *Sykesia rotundifolia* (Bojer) Kuntze, Revis. Gen. Pl. 2: 425. 1891. TYPE: Mauritius. Forests of Grand Port and Savanne and around Grand Bassin, *W. Bojer s.n.* (holotype, P not located; isotype, G-DC!).

Trees or shrubs, 1–6 m tall; *branches* flattened, terete, or quadrangular, glabrous, 3–6 mm diam.; internodes 1.3–4 cm, smooth. *Leaf* blades 1.5–12 × 0.8–5.5 cm, broadly elliptic to obovate or ovate, apex obtuse and shortly acuminate to rounded, base cuneate to subcordate, drying thickly coriaceous, glabrous, margins often thinly revolute; secondary veins flat and visible to prominulous abaxially, 6 to 8 pairs; domatia absent; petioles 7–15 mm. *Stipules* calyptrate, glabrous or puberulent, drying membranous, marcescent, tube 15–20 mm, with ribs 4, narrowly winged, arising beneath petiole but not extending to top, sometimes uniting in basal part of interpetiolar portion, apex with 1 incision, marcescent, lobes 2, 1–2 mm, deltate or linear. *Inflorescences* congested-cymose to subcapitate, many-flowered, terminal on axillary branches, puberulent or glabrous; peduncle 0.5–2 cm; branched portion subglobose or corymbiform, 1.3–4 × 1.5–4 cm, branched to 2 to 3 orders, congested; bracts deltate to linear or trifid, 8–10 mm; bracteoles triangular to lanceolate, 2–4 mm; pedicels absent or to 2 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped or campanulate, 2.5–4 mm wide, outside glabrous, with hair-ring inside, lobes 1–2 mm, triangular to ovate; corolla white, clavate in bud, when open salverform, outside glabrous, tube 15–25 mm, 2–3.5 mm diam., glabrous inside, lobes 5–7 mm, narrowly triangular or ligulate, acute; anthers included, filaments inserted in upper third of corolla tube, ca. 0.5 mm; style 15–25 mm, glabrous, stigmas 2–3 mm. *Short-styled flowers*: similar to long styled except calyx ± campanulate, 2–3.5 mm wide, outside puberulent or glabrous, lobes 1–1.5 mm, triangular to ovate or oblong; corolla clavate in bud or sometimes with appendages at apex, tube 2–4 mm diam., lobes 5–6 mm, narrowly triangular or ligulate to ovate-oblong; anthers shortly exserted, filaments 2–3 mm; style 9–12 mm, stigmas 3–5 mm. *Drupe*s violet-black, ellipsoid to obovoid, 15–17 × 6–8 mm; pyrenes plano-convex, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Mauritius, where it is found in the heathlike vegetation on lava flows (“groundwater laterite”) at elevations of 500–700 m.

Phenology. This species has been collected with flowers in February and December and with fruits in January, February, and May through December.

Discussion. *Gaertnera rotundifolia* and *G. cuneifolia* are generally similar and were considered the same species by Baker (1877); see the discussion under *G. cuneifolia*. *Gaertnera rotundifolia* was treated

as an unnamed variety “β [beta]” of *Chassalia clusiifolia* DC. by de Candolle (Prodr. 4: 532. 1830), based on the specimen *J. B. G. Bory [de St. Vincent] s.n.* (G-DC!). This variety has been cited by some authors (e.g., Verdcourt, 1989), but because it was unnamed it is not validly published.

Representative specimens examined. MAURITIUS. Curepipe, *Vaughan MAU 1655* (MAU); Perrier Reserve, *Vaughan MAU 12271* (MAU); Black River Gorges National Park, Petrin, *Lorence 1548* (MAU, MO), *Malcomber 2949* (MO), *2955* (MO), *Richardson 4078* (K), *Tirvengadam 947* (K); Plaine Champagne, *Puff 800823–1/5* (K).

61. *Gaertnera schatzii* Malcomber, sp. nov. TYPE: Madagascar. Toamasina: Masoala National Park, Antalvia, 15°47'S, 50°02'E, Nov. 1989, *G. E. Schatz 2808* (holotype, MO-3769600!; isotypes, K!, P!, TAN!, WAG!). Figure 2.

Haec species *Gaertnerae griseae* Hook. f. ex C. B. Clarke similis, sed ab ea planta in sicco aurantiaca, stipulis brunneis semel fissis 22–68 mm longis atque tubo corollino extus dense tomentoso distinguitur.

Shrubs or trees, 3–9 m tall; plants drying with orange cast; *branches* terete, when young densely tomentulose to tomentose with indumentum drying reddened to orange, sometimes with indumentum drying brown or becoming glabrescent, 3–6 mm diam.; internodes 1.4–8 cm, smooth. *Leaf* blades 14–29 × 5–10 cm, elliptic to oblanceolate, apex cuspidate to acuminate, base cuneate to rounded, drying chartaceous, adaxially glabrous, abaxially densely pilosulose to tomentose with indumentum drying reddened to yellow-orange; secondary veins prominulous abaxially, 9 to 12 pairs; domatia absent; petioles 5–20 mm. *Stipules* tubular, densely tomentulose to tomentose, drying chartaceous, generally persisting on distalmost 2 to 5 nodes, tube 22–68 mm, with ribs 4, narrowly to broadly winged, arising below petiole and usually extending to lobes, apex with 1 incision, marcescent, lobes 4, 4.8–7.5 mm, deltate to linear. *Inflorescences* cymose, many-flowered, terminal on axillary branches, densely tomentose; peduncle (absent) 4.9–7.8 cm; branched portion corymbiform, 5–11 × 6–13 cm, branched to 4 to 5 orders, lax to congested; bracts deltate or linear, 3–14 mm, sometimes glabrous above; bracteoles reduced; pedicels absent or to 4 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 3.5–5.5 mm wide, outside densely tomentose, glabrous inside, truncate or lobes to 0.5 mm, triangular; corolla white, clavate in bud, when open infundibuliform or salverform, outside densely strigose to tomentose, tube 11–13 mm, 2–5 mm diam., inside villous in upper third, lobes 4–5 mm, triangular or ligulate, acute; anthers included, filaments inserted

in upper third of corolla tube, ca. 0.5 mm; style 10–12 mm, glabrous, stigmas 2–2.5 mm. *Short-styled flowers*: calyx 2.5–5.5 mm wide; corolla tube 10–12 mm, 2–5.5 mm diam.; anthers shortly exerted, filaments 2–3.5 mm; style 3.5–5 mm, stigmas 2–4 mm. *Drupe*s unknown.

Distribution and habitat. This species grows in Madagascar, where it is known from the province of Toamasina in the Masoala National Park. Here, it is found in humid forests at elevations of 0–380 m.

Phenology. This species has been collected with flowers in October and November, but has not been collected with fruits.

Discussion. A localized species, this is only known from the Antalavia River Valley on the west coast of the Masoala Peninsula. *Gaertnera schatzii* can be recognized by its dense pubescence that becomes orange on dried specimens, once-cleft stipules that dry brown, and densely tomentose corolla tubes. This species is named after George Schatz, who collected the type specimen and has made significant contributions to our knowledge of the flora of Madagascar.

Paratypes. MADAGASCAR. **Toamasina**: Masoala National Park, Antalavia, *Rahajaso* 923 (K, MO, P, TAN), 1089 (MO, TAN), *Malcomber* 2825 (MO, P, TEF), 2829 (MO, P, TEF), [no initial] *Moise* 9 (MO).

62. *Gaertnera schizocalyx* Bremek., Bull. Misc. Inform. Kew 1940: 193. 1940. TYPE: Malaysia. Sarawak: Matang, Nov. 1871, *P. B. Beccari* 1799 (holotype, K!; isotype, K!).

Shrubs or small trees, 2–3 m tall; *branches* terete, when young densely hispid to villous with indumentum drying yellow to white, becoming glabrescent, 2.5–6 mm diam.; internodes 3–11 cm, smooth. *Leaf* blades 6–14 × 2–5 cm, elliptic to oblanceolate or obovate, apex cuspidate or acuminate, base obtuse to cuneate, drying chartaceous, adaxially glabrous or hirtellous on principal veins, abaxially densely hispid to villous or villosulous with indumentum drying yellow or gray-white; secondary veins prominulous abaxially, 3 to 7 pairs; domatia absent; petioles 3–7 mm. *Stipules* tubular, densely villous to hispid, drying chartaceous to membranous, persistent on distalmost nodes or deciduous leaving persistent wings, tube 10–15 mm, with ribs 4, broadly winged, arising below petiole and extending to lobes, apex entire or with 2 incisions, marcescent, lobes 4, 2–12 mm, linear to deltate. *Inflorescences* several- to many-flowered, congested to subcapitate, terminal on axillary branches, densely villous to villosulous or pilosulose, sessile or peduncle to 2.5 cm; branched portion subglobose, 1.2–3 × 1.2–3 cm, branched to 1

to 2 orders; bracts deltate or trifid, 1–10 mm; bracteoles reduced; pedicels absent or to 2 mm. *Flowers* 5-merous, unisexual. *Pistillate flowers*: unknown. *Staminate flowers*: calyx campanulate, 1.5–2 mm wide, outside pilosulose to hispidulous, glabrous inside, lobes 0.5–4 mm, narrowly triangular; corolla white, clavate in bud, when open salverform, outside glabrous, tube 4–5 mm, 1.5–2 mm diam., inside villous in upper third, lobes 1.5–2.5 mm, ligulate or ovate-oblong, acute; anthers shortly exerted, filaments inserted in upper third of corolla tube, ca. 0.2 mm; pistillode reduced or absent. *Drupe*s violet-black, globose or didymous, 5–8 × 5–10 mm; pyrenes spherical or hemispherical, ± rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in southeastern Asia, where it is known from Peninsular Malaysia and Borneo in the Sarawak (Malaysia) sector. Here, it can be found in humid forests, usually at the edges of swamps and riverbanks, at an elevation of ca. 10 m.

Phenology. This species has been collected with flowers May through July and with fruits in October and November.

Discussion. *Gaertnera schizocalyx* is not well known. In the Panti Forest Reserve, in Johor, Malaysia, it appears to be restricted to swamp forests. The species can be recognized by its subglobose, subcapitate, sessile or very shortly pedunculate inflorescences, dense hispid to villous indumentum, and well-developed, narrowly triangular calyx lobes. It is similar to *G. capitulata*, which differs in its smaller 4-merous flowers.

Additional specimens examined. MALAYSIA. **Johor**: Panti Forest Reserve, 1.7 km W of Rte. 3, *Malcomber* 3026 (MO); Sungai Kayu, *Kiah SFN* 32015 (A, L, SING); Sungai Kayu, Mawai-Jemaluang rd., *Corner SFN* 32507 (L), 7 July 1935, *E. Corner s.n.* (SING).

63. *Gaertnera spicata* K. Schum., Bot. Jahrb. Syst. 33: 372. 13 Mar. 1903. TYPE: Gabon. Estuaire: Munda [Mondah], Sibange Farm, 21 Aug. 1879, *H. Soyaux* 24 ([holotype, B†]; lectotype, designated here, K!; isotype, P!).

Gaertnera rhodantha Baker, in Oliver, Fl. Trop. Afr. 4 (1, pt. 3): 543. 30 Mar. 1903. TYPE: Gabon. Estuaire: Munda [Mondah], Sibange Farm, 21 Aug. 1879, *H. Soyaux* 24 (holotype, K!; isotype, P!).

Trees or shrubs, 1.5–8 m tall; *branches* terete or quadrangular, when young puberulent with indumentum drying reddish to brown, when older puberulent to glabrescent, 3–6 mm diam.; internodes 1.5–10.5 cm, smooth. *Leaf* blades 18–29 × 5–9 cm, oblanceolate to obovate, apex cuspidate to acute, base attenuate or

cuneate, drying chartaceous, adaxially glabrous, abaxially glabrous or puberulent on principal veins; secondary veins indistinct or prominulous abaxially, 8 to 12 pairs; domatia absent; petioles 15–32 mm. *Stipules* tubular, densely pilosulose or strigillose to glabrescent, drying chartaceous, persistent on distal-most nodes, tube 10–17 mm, with ribs 4, broadly winged, arising below petiole and extending to lobes, apex entire or with 1 or 2 incisions, marcescent, lobes 4, 5–15 mm, deltate to linear; setae numerous, 1.5–6 mm. *Inflorescences* many-flowered, terminal on principal and/or axillary branches, densely strigillose to puberulent; peduncle 2–3.5 cm; branched portion spiciform to narrowly pyramidal, 1.7–5.5 × 0.9–1.5 cm, unbranched or branched to 1 to 2 orders, densely congested; bracts deltate or linear to lanceolate, 1–10 mm, sometimes glabrous; bracteoles reduced. *Flowers* sessile or subsessile, 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 1.5–4.5 mm wide, glabrous or sometimes puberulent outside, truncate or lobes to 0.5 mm, triangular; corolla red to orange-red on tube and red or internally white on lobes, clavate in bud, when open salverform, outside puberulent or glabrous, tube 9–11 mm, 1.5–2.5 mm diam., inside villous in upper third, lobes 3.5–4.5 mm, ligulate to lanceolate, acute; anthers included, filaments inserted in upper third of corolla tube, ca. 0.3 mm; style 10–14 mm, glabrous, stigmas 0.8–1.5 mm. *Short-styled flowers*: similar to long styled except corolla tube 9–10 mm, 1.5–3 mm diam., lobes 4–6 mm; anthers fully exerted, filaments inserted in upper third of tube, 1.5–2 mm; style 5.5–6 mm, stigmas 1.5–2 mm. *Drupe*s reddish brown (*Breteler & de Wilde* 389) or perhaps violet-black, subquadrangular to subglobose, flattened and ± caniculate at apex, 8–11 × 8–12 mm; pyrenes wedge-shaped, rugose, finely fissured.

Distribution and habitat. This species grows in Central Africa, where it is known from Gabon. Here, it is found in coastal forests on white sands, at elevations at sea level or very near it.

Phenology. This species has been collected with flowers August through October and with fruits in January, February, November, and December.

Discussion. *Gaertnera spicata* is a morphologically isolated and geographically restricted species that can be recognized by its narrow, usually cylindrical inflorescences and red to orange flowers. This species is apparently endemic to coastal white sand forests near Cap Esterias, Gabon. Petit (1959b) provided the publication date for *G. rhodantha* Baker, described almost simultaneously with *G. spicata* from a duplicate set of specimens.

Two syntypes were cited in the protologue of *Gaertnera spicata*, *H. Soyaux* 24 (B destroyed, K!, P!) and *H. Soyaux* 178 (B destroyed, P!). The former is selected here as lectotype because it is a more exemplary specimen and has more duplicates. The specimen deposited in the Berlin museum would logically be selected as the lectotype but was destroyed along with the general Rubiaceae collection there; the specimen at K is chosen here as the lectotype because it is a more complete specimen and the selection of it makes the synonymy of these two names indisputable.

The names *Gaertnera spicata* and *G. rhodantha* were described independently and simultaneously, and apparently neither author knew about the other name so the publication of these two names based on the same plants is a coincidence. Each author based his name on a different duplicate from the set of specimens of *Soyaux* 24, thus each of these names has a different holotype or lectotype. Presumably each author intended to include all the duplicate specimens of that set in his species, as is the custom today for designating isotypes and as done here.

Representative specimens examined. GABON. **Estuaire:** Cap Santa Clara & Cap Esterias, *Reitsma* 1336 (WAG); Mondah Forest, 25 km along the rd. from Libreville to Cape Esterias, ca. 1 km from seashore, *Breteler & J. J. F. E. de Wilde* 389 (K, MO, P, WAG); Mt. Bouet, *Leroy* 8 (P).

64. *Gaertnera sralensis* (Pierre ex Pit.) Kerr, Kew Bull. 1940: 180. 1940. Basionym: *Psychotria sralensis* Pierre ex Pit., in Lecomte, Fl. Indochine 3(3): 344. 1924. *Uragoga sralensis* Pierre ex Pit., in Lecomte, Fl. Indochine 3(3): 344. 1924, nom. nud., pro syn. TYPE: Cambodia. “In montibus Sral, prov. de Samrong-tong,” Apr. 1870, *J. B. L. Pierre* 1253 (lectotype, designated by van Beusekom, 1967 [1968]: 386, L!; isotypes, K!, P!).

Shrubs, to 3 m tall; *branches* terete, glabrous, 1.5–4 mm diam.; internodes 1–7 cm, smooth. *Leaf* blades 4–13 × 1–4.5 cm, elliptic-lanceolate to elliptic or oblanceolate, apex acuminate to cuspidate, base ± attenuate to cuneate, drying chartaceous, glabrous to variously pubescent, drying green or grayish green or infrequently brown, gray, chestnut, reddish brown, or with a distinctive orange cast; secondary veins distinct abaxially, 4 to 7 pairs; domatia absent; petioles 4–15 mm. *Stipules* tubular, glabrous, drying chartaceous, caducous or deciduous through fragmentation, tube ca. 16 mm, with ribs 4, narrowly winged, arising below petiole and extending to lobes, apex with 1 or 2 incisions, marcescent, lobes 4, ca. 1.6 mm, filiform. *Inflorescences* congested-cymose, several- to sometimes many-flowered, terminal on principal and/or

axillary branches, glabrous, sessile or peduncle to 0.3 cm; branched portion subglobose, $0.5\text{--}1.5 \times 0.5\text{--}2$ cm, branched to 1 to 2 orders; bracts deltate to linear or trifid, 1–2 mm; bracteoles reduced; pedicels absent or to 1.5 mm. *Flowers* 5-merous, unisexual. *Pistillate flowers*: unknown. *Staminate flowers*: calyx cup-shaped, 3–3.5 mm wide, outside glabrous, with hair-ring inside, truncate or lobes to 0.4 mm, triangular; corolla in bud white, outside glabrous, up to 3.5–4 mm, 1.5–2 mm diam., inside villous in upper third, lobes 2.5–3 mm, triangular to ligulate, acute; filaments inserted in upper third of corolla tube, ca. 0.5 mm; stamens not seen; pistillode reduced. *Drupes* violet-black, globose, $6\text{--}8 \times 6\text{--}8$ mm; pyrenes hemispherical or spherical, $\pm$ rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in southeastern Asia, where it has been found in Cambodia, Peninsular Malaysia, Thailand, and Vietnam. Here, it grows in humid forests at elevations of 600–1800 m.

Phenology. This species has been collected with flowers January through July and with fruits January through April and October through December.

Discussion. Van Beusekom (1967) considered *Gaertnera sralensis* a synonym of his widely circumscribed *G. vaginans* subsp. *junghuhniana*. With the narrower circumscription of *G. junghuhniana* adopted here, *G. sralensis* is recognized as a separate species distinguished by its subglobose inflorescences, glabrous vegetative structures, and calyx with a hair-ring inside. This species belongs to the *G. vaginans* complex; see also the discussion of that group for related species and their distinctions.

In the protologue, several syntype specimens were cited but without number. These can now be detailed: *J. B. L. Pierre* 1253 (the lectotype) (L!), *J. B. L. Pierre* 3247 (P!), *E. Poilane* 237 (BM!, P!), 274 (P!), [no initial; Vegter, 1988] *Talmy* s.n. (P!), and *C. Thorel* 1165 (P!). Two names were published simultaneously for this species by Pitard in the protologue of *Psychotria sralensis*, *P. sralensis* which included *Uragoga sralensis*, which was listed there as a synonym and thus not validly published. The name *P. sralensis* was specifically cited as the basionym for *Gaertnera sralensis*, thus Kerr regarded it as the validly published name. Later, without explanation, van Beusekom (1968: 386) subsequently cited *U. sralensis* as the validly published name and *P. sralensis* as an invalid synonymous name. However, van Beusekom's usage is contrary to the presentation of these names in the protologue, where *P. sralensis* was clearly intended by Pitard to be the accepted

name for this species: he included this species in the treatment of the genus *Psychotria*; the name *P. sralensis* is placed at the beginning of this treatment in boldface type similar to all the other accepted names there, while the name *U. sralensis* is placed second and in italic type similar to other synonyms there; and this species is called *P. sralensis* in the key there.

Representative specimens examined. CAMBODIA. Mont de l'Eléphant, *Poilane* 237 (BM, P). MALAYSIA. **Pahang:** Gunong Benom, 29 July 1925, *Federation of Malay States Museum Collector* s.n. (BM, K). THAILAND. **Central:** Kao Kuap, *Kerr* 17764 (BM, K, L), 17798 (BM, K), *Put* 2864 (BM, K, L), 2939 (BM, K, L). **South:** Khao Luang, *Van Beusekom* 839 (K, L). VIETNAM. **Prov. Baria [Ba Ria]:** Mt. Dinh, *Pierre* 3247 (P); Ti-tinh, *Thorel* 1165 (P).

65. *Gaertnera ternifolia* Thwaites, Enum. Pl. Zeyl. 202. 1864. *Sykesia ternifolia* (Thwaites) Kuntze, Revis. Gen. Pl. 2: 426. 1891. TYPE: Sri Lanka. Near Adam's Peak, *G. H. K. Thwaites* CP 440 (lectotype, designated by van Beusekom, 1967 [1968]: 381, P!; isotypes, BM!, BR!, CGE!, G!, GH!, K!, P!, W!, WU!). [SYNTYPE: *G. H. K. Thwaites* CP 457 (K!).] Figure 14G–M.

Gaertnera walkeri var. *angustifolia* Benth., J. Proc. Linn. Soc., Bot. 1: 111. 1857. TYPE: Sri Lanka. s. loc., *G. H. K. Thwaites* CP 440 (lectotype, designated by van Beusekom, 1967 [1968]: 381, P!; isotypes, BM!, BR!, CGE!, G!, GH!, K!, P!, W!, WU!).

Trees or shrubs, 1–5 m tall; *branches* terete, when young puberulent or glabrous with indumentum drying yellow or gray-white, becoming glabrescent, 1–5 mm diam.; internodes 0.1–1.2 mm, smooth or with 3 longitudinal ribs. *Leaf* blades $0.5\text{--}2.5 \times 0.1\text{--}0.3$ cm, narrowly oblong or linear-lanceolate, apex acuminate to acute, base acute to cuneate, drying coriaceous, glabrous to pustulose-scaberulose, margin flat to revolute; secondary veins not visible; domatia absent; petioles 0.2–0.7 mm. *Stipules* shortly tubular to subinterpetiolar, glabrous to densely puberulent, drying chartaceous or membranous, persistent, tube 0.1–0.3(–1) mm, with ribs 6, arising below petioles then uniting in the middle of each interpetiolar side and extending to lobes, apex with 3 incisions, marcescent, lobes 3, 0.1–3 mm, deltate. *Inflorescences* reduced to 1 flower or 2 to 3 fasciculate flowers, terminal, pendulous; peduncles (1–)2–7 mm, puberulent; bracts deltate to linear, 1.5–3 mm, glabrous or puberulent; bracteoles linear, ca. 1 mm, ciliolate. *Flowers* 5(6)-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 2–3.1 mm, outside glabrous to puberulent, glabrous inside, lobes 1.2–2 mm, triangular to linear; corolla white, clavate in bud, when open campanulate, outside glabrous, tube 8–11 mm, 1.5–6.5 mm diam., inside villous at ca.

middle, lobes 2–5 mm, triangular to ligulate, acute; anthers included, filaments inserted at ca. middle of corolla tube, 0.4–0.6 mm; style 7–12.5 mm, glabrous, stigmas 1–1.5 mm. *Short-styled flowers*: similar to long styled except corolla tube 8–12 mm, 1.4–6 mm diam., lobes 3–4 mm; anthers shortly exserted, filaments 3–4 mm; style 3.5–6.5 mm. *Drupes* violet-black, globose or subglobose or didymous, 6–8 × 6–8 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Sri Lanka, where it lives in wet premontane and montane forests at elevations of 1350–2000 m.

Phenology. This species has been collected with flowers June through October and with fruits January through June and in November and December.

Discussion. *Gaertnera ternifolia* is an attractive and morphologically isolated species distinguished by its relatively small ternate leaves, short persistent stipules, few-flowered inflorescences, and campanulate flowers. There has been some confusion of *G. ternifolia* with *G. ×gardneri*, presumed here to be a natural hybrid between *G. ternifolia* and *G. walkeri*. *Gaertnera ×gardneri* differs from *G. ternifolia* in its mixed opposite and ternate leaves and salverform corolla.

Van Beusekom (1967) cited the *Thwaites CP 440* collection deposited at P as the “holotype” of this species, without explanation. In general, Thwaites’ first set and his (de facto) holotypes are assumed to be deposited at K (Stafleu & Cowan, 1986), and van Beusekom does cite an isotype of *Gaertnera ternifolia* at K so the basis for his selection of the P specimen is unclear; no one else seems to have previously specified any individual collection as the type of that species. In his next nomenclatural paragraph here, for *G. ternifolia* var. *angustifolia* he cites the type as “Lectotype: same as that of *G. ternifolia*.” Thus, these are both considered lectotypifications here, following what at least appears to be van Beusekom’s intent. The reason for his selection of the same lectotype specimen for both names is also not explained; these selections, if accepted by others, do definitively reduce these names to synonymy.

Representative specimens examined. SRI LANKA. **Kandy [Sabaragamuwa Province]**: Adam’s Peak, Moray Estate, *Kostermans* 24210 (G, K, L), 24213 (G, K, L), *Sohmer* 9884 (GH, K, PDA), *Burt* 88 (K, MO, PDA), *Kostermans* 27020 (G, K, L); Ratnapura, Pinnawala, *Balakrishnan* 548 (K, PDA). **Central Province**: Nuwara Eliya, Peak Wilderness National Park, *Malcomber* 2766 (MO, PDA), 2767 (MO, PDA), *Waas* 1693 (E, GH, K, L, MO, PDA).

66. *Gaertnera trachystyla* (Hiern) E. M. A. Petit, Bull. Jard. Bot. État Bruxelles 29: 382. 1959.

Basionym: *Psychotria trachystyla* Hiern, Fl. Trop. Afr. 3: 213. 1877. TYPE: W tropical Africa, Mt. John River, 1°N, 1862, *G. Mann* 1791 (holotype, K!).

Gaertnera dinklagei K. Schum., Bot. Jahrb. Syst. 28: 88. 1899, syn. nov. TYPE: Cameroon. Bipinde, 1898, *G. Zenker* 1763 (lectotype, designated here, MO!; isotypes, BR!, E!, G!, K!, L!, P!, W!, WAG!, WU!).

Gaertnera salicifolia C. H. Wright ex Baker, Fl. Trop. Afr. 4: 543. 1903. TYPE: Gabon. Estuaire: Mfôa, *G. Bates* 516 (holotype, K!; isotypes, BM!, BR!, G!, P!).

Trees or shrubs, 1.5–3.5 m tall; *branches* terete or flattened at apex, terete below, glabrous to puberulent, 1–4 mm diam.; internodes 0.6–9 cm, smooth. *Leaf* blades 5.4–23 × 1.8–7.6 cm, elliptic to obovate or ovate, apex cuspidate to acute, base acute to cuneate or obtuse, drying chartaceous, adaxially glabrous, abaxially glabrous or puberulent to pilosulose on principal veins; secondary veins prominulous abaxially, 4 to 10 pairs; domatia absent or present; petioles 2–15 mm. *Stipules* tubular, glabrous to densely puberulent or pilosulose, drying chartaceous, caducous or with persistent base 1–2 mm, tube 4–25 mm, with ribs 4, narrowly winged, arising above to below petiole and occasionally extending to lobes, apex entire or with 1 or 2 incisions, marcescent, lobes 4, 0.3–5 mm, deltate to linear. *Inflorescence* cymose to paniculiform, many-flowered, terminal on principal and/or axillary branches, densely puberulent to pilosulose, deflexed to pendulous; peduncle 1.2–8.5 cm long; branched portion narrowly pyramidal or corymbiform, 2–23.5 × 3–19 cm, branched to 1 to 4 orders, lax; axes usually divergent at ca. 90 degrees; bracts deltate or trifid, 1–4 mm, glabrous or pubescent; bracteoles reduced; pedicels 1–9 mm. *Flowers* 4- or 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 1.5–2.5 mm wide, outside glabrous to densely puberulent, with hair-ring inside, truncate or lobes to 0.4 mm, triangular; corolla white, clavate in bud, when open salverform, outside glabrous, tube 2.4–3.5 mm, 1–1.7 mm diam., inside villous in upper third, lobes 2.5–3.5 mm, ligulate to elliptic-oblong, acute; anthers included, filaments inserted in upper third of corolla tube, ca. 0.3 mm; style 5–6 mm, glabrous or pubescent near apex, stigmas 0.5–1.1 mm. *Short-styled flowers*: similar to long styled except corolla tube 3–4.5 mm, 1–2 mm diam., lobes 3–4 mm, ligulate to ovate-oblong; anthers fully exserted, filaments 2.5–4 mm; style 2–2.5 mm, glabrous, stigmas 1–1.5 mm. *Drupes* violet-black, globose or subglobose, 6–9 × 6–9 mm; pyrenes spherical or hemispherical, faintly rugose, deeply fissured, endosperm entire.

Distribution and habitat. This species grows in Central Africa, where it is known from Cameroon,

Equatorial Guinea, and Gabon. Here, it is found in wet forests at elevations of 100–300 m.

Phenology. This species has been collected with flowers January through May and September through December, and with fruits in January, February, November, and December.

Discussion. *Gaertnera trachystyla* is variable in leaf shape but can be recognized by its deflexed to pendulous, many-flowered, pyramidal cymes with the axes usually spreading at ca. 90 degrees, and its usually well-developed pedicels. Schumann described *G. dinklagei* as having 4-merous flowers, but close inspection of the type and paratype specimens studied by him reveals that both 4- and 5-merous flowers are borne in the same inflorescence. No morphological characters separate *G. trachystyla* from plants described as *G. dinklagei* and *G. salicifolia* C. H. Wright ex Baker and these are considered synonyms here.

The type collection of *Gaertnera dinklagei* has numerous duplicates that are all equally complete and exemplary specimens, as with most collections by Zenker. The holotype specimen was not explicitly designated in the protologue but would have been the one at B; however, it also would have been destroyed there along with the general Rubiaceae collection so it is presumably lost and a lectotype is needed. The MO specimen is selected as the lectotype here for its good condition and for convenience.

Representative specimens examined. CAMEROON. 2–8 km S of Kribi, *Bos* 3166 (K, MO, P, WAG), *Bos* 3982 (MO, P, WAG), *Bos* 4429 (P, WAG); Bipinde, *Zenker* 2393 (BM, BR, E, G, K, L, P, W, WAG, WU), 4760 (BM, BR, G, K, L, MO, P, W). EQUATORIAL GUINEA. Miton, *Sonké & Esono* 3106 (MO). GABON. **Estuaire:** Mondah Forest, 25 km Libreville–Cap Esterias rd., *Breteler & J. J. F. E. de Wilde* 382 (K, MO, P, WAG); Monts de Cristal, Kinguéle rapids, Mbei River, *N. Hallé* 4437 (P), *W. Hallé & Villiers* 4664 (MO, P). **Ngounié:** 2–15 km SE of forestry Camp Waka, *A. M. Louis* 1344 (WAG), 1309 (K, WAG).

67. *Gaertnera vaginans* (DC.) Merr., Enum. Born. Pl. 580. 1921. Basionym: *Psychotria vaginans* DC., Prodr. 4: 520. 1830. *Ophioxylon arboreum* J. Koenig ex DC., Prodr. 4: 520. 1830, nom. nud., pro syn. *Sykesia koenigii* Arn., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 353. 1836, nom. superfl. illeg. *Gaertnera koenigii* (Arn.) Wight, Icon. Pl. Ind. Orient. 4: 6, t. 1318. 1848, as “*konegii*,” nom. superfl. illeg. *Sykesia vaginans* (DC.) Kuntze, Revis. Gen. Pl. 2: 426. 1891. TYPE: Sri Lanka. s. loc., in herb. Van Royen 108, *J. G. Koenig s.n.* (holotype, L!; isotype, L!). Figure 15G–N.

Sykesia thyrsiflora Arn., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 18: 353. 1836. *Gaertnera thyrsiflora* (Arn.) Blume, Mus. Bot. 1: 174. 1850. *Gaertnera koenigii* var. *thyrsiflora* (Arn.) Thwaites, Enum. Pl. Zeyl. 202: 1860, nom. illeg. TYPE: Sri Lanka. s. loc., *G. W. Walker* 58 (lectotype, designated by van Beusekom, 1967 [1968]: 385, E!; isotype, E!).

Trees or shrubs, 1–6 m tall; *branches* terete to flattened, glabrous, 1–10 mm diam.; internodes 1–5.5(–10.5) cm, smooth. *Leaf* blades 3–20 × 1.5–9 cm, narrowly elliptic to obovate, broadly elliptic, or elliptic-oblong, apex acute to acuminate or rounded, base cuneate to acute, drying chartaceous, glabrous; secondary veins prominent abaxially, 4 to 9 pairs; domatia absent or present; petioles 0.5–32 mm. *Stipules* tubular, glabrous, drying chartaceous, deciduous through fragmentation, tube 7–22(–27) mm, with ribs none or 4, narrowly winged, arising below petiole and sometimes extending to lobes, apex with 1 or 2 incisions, marcescent, lobes 2 or 4, 0.5–2.5 mm, deltate. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches, puberulent or glabrous, sessile or peduncle 2–7.5 cm; branched portion corymbiform or pyramidal, (2.5–)10–24 × (1.1–)7–17 cm, branched to 2 to 5 orders, sometimes congested near apex; bracts deltate or linear, 1.5–10 mm; bracteoles reduced; pedicels absent or to 5 mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers:* calyx cup-shaped, 2.5–4 mm wide, outside glabrous or puberulent, glabrous or with hair-ring inside, lobes 0.4–0.9 mm, triangular; corolla white, clavate in bud, when open infundibuliform or salverform, outside glabrous to puberulent, tube 4–5.5 mm, 1.5–3.5 mm diam., inside villous in upper third, lobes 3–7 mm, ligulate to elliptic-oblong, acute; anthers included, filaments inserted in upper third of corolla tube, ca. 0.5 mm; style 6–10 mm, glabrous (pubescent near apex), stigmas 0.7–1.5 mm. *Short-styled flowers:* similar to long styled except calyx lobes 0.4–1 mm; corolla tube 4–6 mm, 1–3.5 mm diam., lobes ligulate; anthers shortly exserted, filaments 2–4 mm; style 2.5–4.5 mm, stigmas 1–2.5 mm. *Drupe*s violet-black, subglobose or didymous, 4–8 × 4–9 mm; pyrenes spherical or hemispherical, faintly rugose, deeply fissured, endosperm entire.

Distribution and habitat. This species grows in Sri Lanka, where it can be found in wet and premontane forests at elevations of 50–900 m.

Phenology. This species has been collected with flowers January through May and August through December, and with fruits January through April and August through December.

Discussion. *Gaertnera vaginans* is a morphologically variable species, but can be recognized by its

chartaceous tubular stipules that closely surround the stem, its corymbiform to pyramidal, erect, cymose inflorescences, and its bisexual flowers with corolla tubes glabrous to puberulent outside. This and a number of closely related species form the *G. vaginans* complex; see also the discussion of that group for related species and their distinctions and see the discussion of *G. junghuhniana* for further discussion of *G. vaginans*.

Representative specimens examined. SRI LANKA. **Galle Distr.:** Hiniduma Pattuwa, Tawalama, *Hoogland* 11406 (A, BR, E, K, L, PDA). **Kalutara Distr.:** Pahingala, *Sohmer* 10231 (GH, K, MO, P, PDA, W). **Kandy Distr.:** Laxapana-Maskeliya, Doublecutting, *Kostermans* 24101 (A, BM, G, K, L). **Ratnapura Distr.:** Carney, *Sohmer* 8797 (BM, GH, MO); Kudawe, Weddagala, *Hoogland* 11451 (BM, G, L, PDA).

68. *Gaertnera vaginata* Lam., *Tabl. Encycl.* 2: 273. 1797. *Sykesia vaginata* (Lam.) Kuntze, *Revis. Gen. Pl.* 2: 426. 1891. TYPE: "Île de France" [but surely mislabeled, Verdcourt, 1983], *Commerson s.n.* (holotype, FI not seen; isotypes, G!, P!, P-LA!).

Andersonia vaginata Willd. ex Roem. & Schult., *Syst. Veg.* 5: 21. 1819. TYPE: Madagascar. s. loc., *A. du Petit-Thouars s.n.* (holotype, B-WILLD not seen).

Gaertnera laxiflora Cordem., *Fl. Réunion* (E. J. de Cordemoy) 470. 1895. TYPE: La Réunion. Plaine des Caffres, Grand Tampon, *E. J. de Cordemoy s.n.* (holotype, MARS!).

Gaertnera godefroyana Cordem., *Fl. Réunion* (E. J. de Cordemoy) 469. 1895. TYPE: La Réunion. Petite Plaine des Palmistes, pres de la Grande Montée, Propriété Godefroy, *E. J. de Cordemoy s.n.* (holotype, P not located; isotype, MARS!).

Trees or shrubs, 1–7 m tall; *branches* terete, glabrous, 2–5.5 mm diam.; internodes 1.5–4 cm, smooth. *Leaf* blades 2.5–15.5 × 1–5 cm, oblanceolate to obovate, elliptic-oblong, or elliptic, apex acuminate, base acute, drying chartaceous, adaxially glabrous, abaxially glabrous and often glaucous; secondary veins prominulous abaxially, 7 to 10 pairs; domatia present; petioles 5–23 mm. *Stipules* tubular, glabrous, drying chartaceous, deciduous or usually persistent at least on distalmost 2 to 4 nodes, tube 4–6 mm, with ribs 4, rounded to narrowly winged, arising beneath petiole and sometimes extending to lobes, apex entire, marcescent, lobes 4, 1–7 mm, linear or filiform, setae 4 to 8, 1–5 mm. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches, glabrous to densely puberulent; peduncle 1.5–6 cm; branched portion corymbiform, 1.5–5 × 2–5 cm, branched to 2 to 3 orders, congested; bracts deltate or fused and trifid, 2–10 mm; bracteoles ovate to elliptic or triangular, 2–4 mm; pedicels absent or to 3.5 mm. *Flowers* 5–

merous, heterodistylous. *Long-styled flowers:* calyx campanulate, 2–4 mm wide, outside glabrous or puberulent, with hair-ring inside, lobes 1–2 mm, ovate to oblong or triangular; corolla white, clavate in bud, when open salverform, outside glabrous (puberulent), tube 16–25 mm, 4–9 mm diam., inside glabrous, lobes 7–11 mm, triangular to ligulate or elliptic-oblong, acute; anthers included (shortly exserted), filaments inserted at ca. middle of corolla tube, 0.5–1.5 mm; style 15–21 mm, glabrous, stigmas 1–2.5 mm. *Short-styled flowers:* similar to long styled except corolla tube 18–20 mm, 4–6 mm diam.; anthers shortly exserted, filaments inserted in upper third of corolla tube, 4–5 mm; style 9–10 mm, stigmas 3.5–4 mm. *Drupe*s violet-black, ellipsoid to subglobose, 10–18 × 7–15 mm; pyrenes (1)2 per drupe, plano-convex, faintly rugose, deeply fissured, endosperm entire.

Distribution and habitat. This species grows in the Mascarene Islands, where it is known from the island of Réunion. Here, it can be found in wet lowland forests, humid middle-elevation forests, and cloud forests at elevations of 100–1800 m.

Phenology. This species has been collected with flowers January through May and August through December, and with fruits January through July and September through December.

Discussion. *Gaertnera vaginata* is widespread and frequently collected on Réunion and can be recognized by its acuminate leaves, stipules with numerous well-developed setae, relatively large white flowers, and ellipsoid or subglobose drupes. The type specimen was attributed to Mauritius, but Verdcourt (1983) noted that this specimen is undoubtedly mislabeled and comes instead from La Réunion. The fleshy, relatively large, white flowers are said to be fragrant (e.g., *Lorence* 1425 [MO]); these were collected in the middle of the day (D. H. Lorence, pers. comm.). The authorship and place of publication of the name *G. vaginata* have been variously and usually incorrectly attributed. The name *Mussaenda borbonica* Lapeyrère (Rev. Agric. Île Maurice 2: 85. 1889, as to type based on a plant collected at Petit Brule de Saint Denis, La Réunion) has been cited as a synonym of *G. vaginata* (Verdcourt, 1983), but because of the lack of a physical type, may not be included in formal synonymy here.

Representative specimens examined. FRANCE, RÉ-UNION. Mare Longue, *Barclay* 630 (K, MAU), *Bernardi* 14503 (G, K, P), *Cadet* 1179 (K), *Tirvengadam* 11 (MAU, P); Plaine des Chicots, *Billiet* 832 (BR, K), *Capuron SF* 28160 (MAU, P); Plaine des Palmistes, *Cadet* 592 (K), *Friedmann* 2247 (G, MO, P), *Kramer* 9220 (MO); Saint Philippe,

Bernardi 15035 (BM, K, P), *Boyer* 59 (P), *Schlieben* 10921 (BR, MAU, MO).

- 69. *Gaertnera viminea*** Hook. f. ex C. B. Clarke, in Hook. f., *Fl. Brit. India* 4: 91. 1883. *Psychotria viminea* Wall., *Numer. List [Wallich] Cat.* n. 8354. 1847, nom. nud. *Sykesia viminea* (Hook. f. ex C. B. Clarke) Kuntze, *Revis. Gen. Pl.* 2: 425. 1891. TYPE: Singapore. *N. Wallich* 8354 (holotype, K!; isotypes, BM!, CGE!, K!).

Trees or shrubs, 3–6 m tall; *branches* terete to flattened, puberulent or glabrous with indumentum drying brown, 1–2 mm diam.; internodes 2–5 cm, smooth. *Leaf* blades (3–)4–10 × (0.75–)1–4 cm, linear-lanceolate to lanceolate or oblong, apex cuspidate or acuminate, base acute to cuneate, drying chartaceous, glabrous; secondary veins prominulous abaxially, 4 to 7 pairs; domatia absent; petioles 2–10 mm. *Stipules* tubular, glabrous, drying chartaceous, persistent or caducous, tube 4–10 mm, with ribs 4, narrowly winged, arising below petiole and sometimes extending to lobes, apex entire, marcescent, lobes (2 or)4, 0.5–1.5 mm, filiform. *Inflorescences* cymose, many-flowered, terminal on principal and/or axillary branches, puberulent to glabrous, sessile or peduncle 1.2–2 cm; branched portion corymbiform, 0.8–7 × 2.5–6 cm, branched to 2 to 4 orders, congested at least near apex; bracts deltate or linear to ligulate, 0.2–3 mm; bracteoles reduced; pedicels absent or to 2 mm. *Flowers* 4-merous, unisexual. *Pistillate flowers*: calyx cup-shaped, 1–2 mm wide, outside glabrous or puberulent, with hair-ring inside, lobes to 0.5 mm, triangular; corolla white, clavate in bud, when open salverform, outside glabrous, tube 3.5–6 mm, 0.75–1.5 mm diam., inside villous in upper third, lobes 0.5–1.5 mm, ligulate or ovate-oblong, acute or obtuse; staminodia included, filaments inserted in upper third of corolla tube, ca. 0.3 mm; style 3–4 mm, glabrous (pubescent near apex), stigmas ca. 1 mm long. *Staminate flowers*: similar to pistillate except corolla tube 3.5–4 mm, 0.8–1.2 mm diam., lobes ca. 1.5 mm, ligulate; anthers shortly exerted, filaments 0.3–0.4 mm; pistillode reduced or absent. *Drupe*s violet-black, globose, 5–6 × 5–6 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in southeastern Asia, where it is known from Peninsular Malaysia and Singapore. Here, it is found in humid forests at elevations of 60–1290 m.

Phenology. This species has been collected with flowers January through June and in November and December and has been collected with fruits, but the collection dates have not been recorded.

Discussion. *Gaertnera viminea* is very similar to some plants of *G. junghuhniana*, but can be distinguished by its relatively slender branches, few-flowered cymes, and 4-merous flowers. Van Beusekom (1967) noted that a report of this species from Borneo by Merrill (1921) is apparently erroneous and based on misidentification, probably of a plant treated here as *G. junghuhniana*.

Representative specimens examined. MALAYSIA. **Johor:** Gunong Panti, *Corner* SING 29968 (KEP); Gunong Pulai, *Md. Nur* 7765 (K). **Selangor:** Gunong Lauit, Ulu Trengganu, *Ng FRI* 22075 (K, KEP). SINGAPORE. Bukit Timah, *Ridley* 4828b (BM, K, SING), 8923 (SING), *Sinclair* 5325 (E); National Botanic Gardens, Garden Jungle, *Malcomber* 3010 (MO), *Ridley* 13 (SING).

- 70. *Gaertnera walkeri*** (Arn.) Blume, *Ill. Ind. Bot.* 2, t. 156b. 1850. Basionym: *Sykesia walkeri* Arn., *Pug. Pl. Ind. Or.* 354. 1836. TYPE: Sri Lanka. s. loc., *G. W. Walker* 102 (lectotype, designated by van Beusekom, 1967 [1968]: 380, E!). Figure 12E–J.

Trees, 1–4 m tall; *branches* terete, glabrous, 0.7–3.5 mm diam.; internodes 1.5–7 cm, smooth. *Leaf* blades (1.5–)2.8–7.2(–9.4) × 0.4–2.9(–4) cm, lanceolate or elliptic, apex cuspidate or acuminate, base cuneate to acute, drying chartaceous, glabrous; secondary veins prominulous abaxially, 2 to 6 pairs; domatia present; petioles 2–12 mm. *Stipules* tubular, glabrous, drying chartaceous or membranous, caducous or deciduous through fragmentation, tube 3–10 mm, smooth, apex entire, marcescent, truncate or with lobes 2 to 4, 0.1–0.5 mm, deltate. *Inflorescences* cymose, few- to several-flowered, terminal on principal and/or axillary branches, glabrous or puberulent; peduncle 0.9–1.4(–2) cm; branched portion corymbiform, 1.5–5 × 1.5–4.5 cm, branched to 1(2) orders, lax; bracts deltate or linear, 2–4.5 mm; bracteoles reduced; pedicels absent or 0.8–11(–22) mm. *Flowers* 5-merous, heterodistylous. *Long-styled flowers*: calyx cup-shaped, 2.5–3.5 mm wide, outside glabrous or puberulent, glabrous inside, lobes 0.3–0.5 mm, triangular; corolla white, clavate in bud, when open salverform, outside glabrous, tube 10–12 mm, 2–5 mm diam., inside villous at ca. middle, lobes 5–7.5 mm, ligulate to elliptic-oblong, acute; anthers included, filaments inserted at ca. middle of corolla tube, 0.3–0.8 mm; style 10–12 mm, glabrous to scabrous, stigmas 0.4–2.5 mm. *Short-styled flowers*: similar to long styled except corolla tube 8.5–12 mm, 1.9–5 mm diam., lobes 5–6.5 mm; anthers shortly exerted, filaments 1–2.5 mm; style 4–5 mm, glabrous, stigmas 1.5–2.5 mm. *Drupe*s violet-black, globose to subglobose, 8–9 × 8–9 mm; pyrenes spherical or hemispherical, rugose, finely fissured, endosperm entire.

Distribution and habitat. This species grows in Sri Lanka, where it is found in premontane and montane forests at elevations of 750–1650 m.

Phenology. This species has been collected with flowers February through September and with fruits April through November.

Discussion. *Gaertnera walkeri* is generally similar to *G. ramosa* of western Malaysia and to *G. rosea*, also of Sri Lanka; *G. ramosa* differs in its unisexual flowers with shorter corolla lobes, and *G. rosea* differs in its 1- to 3-flowered and fasciculate inflorescences. In areas where *G. walkeri* and *G. ternifolia* grow sympatrically (e.g., Adam's Peak), the natural hybrid *G. ×gardneri* occasionally occurs. *Gaertnera ×gardneri* differs from *G. walkeri* in having mixed opposite and ternate leaves and ridged internodes.

The lectotype was originally designated as a specimen at GL in the G. A. Walker Arnott herbarium, but this collection has been moved to E.

Representative specimens examined. SRI LANKA. **Kandy Distr.:** Knuckles, Madulkelle, *Kostermans* 25017 (A, BM, K, L, PDA). **Matara Distr.:** North Enselwatte, Sinharaja, *Sohmer* 10461 (GH, K, MO), *Waas* 1483 (K, MO, PDA). **Nuwara Eliya Distr.:** Peak Wilderness National Park, lower slopes Adam's Peak, *Malcomber* 2764 (MO, PDA), 2765 (MO, PDA). **Ratnapura Distr.:** Dotalugala Forest, *Waas* 1840 (E, L, MO).

NAMES OF UNKNOWN IDENTITY

Frutesca mauritiana DC. ex Meisn., Pl. Vasc. Gen. 1: 259, 2: 168. 1840. TYPE: Mauritius, not designated.

As discussed in the introduction, this name applies to a species of *Gaertnera* from Mauritius, but which species is unclear.

Gaertnera boivinii Drake, Bull. Soc. Bot. France, 45: 354. 1898 [1899]. TYPE: Mauritius. s. loc., *Boivin* s.n. (holotype, P not located).

Neither the Boivin specimen nor any other specimens annotated by Drake with this name have been located and the description is inadequate, thus the identity of this name is unknown.

Gaertnera borneensis Valetton, Bot. Jahrb. Syst. 44: 568. 1910. TYPE: Borneo. Betw. Buntok & Djihi, *Winkler* 3321 (holotype, BO not seen).

This name was treated as a synonym of *Gaertnera vaginans* subsp. *junghuhniana* by van Beusekom (1967). However, no specimens identified with this name by Valetton have been seen, and *G. junghuhniana* is circumscribed much more narrowly here than by van Beusekom. The description suggests that this

species probably falls within *G. junghuhniana* as circumscribed here, but because of the complicated morphological patterns in this group, this placement needs to be confirmed with the study of specimens.

Gaertnera chapelieri Drake, Bull. Soc. Bot. France 45: 355. 1898 [1899]. TYPE: Madagascar. s. loc., *Chapelier* s.n. (holotype, P not located).

Neither the Chapelier specimen nor any other specimens annotated by Drake with this name have been located and the description is inadequate, thus the identity of this name is unknown.

Gaertnera longiflora C. F. Gaertn., Suppl. Carp. 59, t. 191, fig. 1. 1806. TYPE: Madagascar. s. loc., *Commerson* s.n. (holotype, TUB not seen).

This species is described and illustrated as having an irregularly, distinctly lobed calyx, ellipsoid-ovoid fruits, well-developed bracteoles, and flowers and fruits variously sessile to shortly pedicellate. No specimen has been seen that can be connected conclusively to this name, and its identity is unclear.

Gaertnera oxycarpa Drake, Bull. Soc. Bot. France 45: 354. 1898 [1899]. TYPE: probably Mauritius, s. loc., *Dupetit-Thouars* s.n. (holotype, P not located).

Neither the Dupetit-Thouars specimen nor any other specimens annotated by Drake with this name have been located and the description is inadequate, thus the identity of this name is unknown.

Gaertnera stictophylla (Hiern) E. M. A. Petit, Bull. Jard. Bot. État Bruxelles 29: 382. 1959. Basionym: *Psychotria stictophylla* Hiern, in Oliver, Fl. Trop. Afr. 3: 212. 1877. TYPE: Gabon. Estuaire: Sierra del Crystal Mtns., 1862, *Mann* 1721 (holotype, K photo!).

Only a photograph of the type specimen at Kew has been seen. The identity of this species, including its generic placement, is difficult to confirm because the stipules on the type specimen are poorly conserved and the inflorescence is immature. Petit (1959b) was also unsure of the identity of this species, which he said seemed to him similar to *Gaertnera liberiensis* but apparently lacks the distinctive stipules of that species.

Gaertnera thouarsii Baill., Bull. Mens. Soc. Linn. Paris 1: 209. 1879, nom. nud. TYPE: Mauritius. *P. Dupetit-Thours* s.n. (holotype, P not located).

This name was published with no description at all, simply the explicit citation of the name and Baillon's intent to name a species, and the comment that the name is based on a specimen of Dupetit-Thouars that is found in several herbaria and variously identified as

Psychotria in some and *Gaertnera* in others. No specimens with this name have been located, and its identity is unclear.

Sykesia lanceolata Kuntze, Revis. Gen. Pl. 2: 425. 1891, nom. nud.

This name was published in Kuntze's summary of *Sykesia*, the name he used to replace *Gaertnera*, which he knew to be a later homonym. This *Sykesia* name appears in a list of new nomenclatural combinations for species previously treated in *Gaertnera* and was said to be based on a *Gaertnera* name published by Bojer, but that previously published name has not been found. Kuntze may have intended to reference and make a new combination for *G. lanceolata* Bouton ex A. DC., which is otherwise not listed by him, but he did not identify the basionym well enough to exclude any names published in other genera with the same epithet by Bojer, so the identity of this is not clear.

EXCLUDED NAMES

Several names listed here were published in different, homonymic genera also named *Gaertnera*, which belong to other families as noted. Several names published in the essentially homonymic genus *Gaertneria* (Asteraceae) are not listed here, although they have sometimes been misspelled as "*Gaertnera*."

Gaertnera australiana C. T. White, Proc. Roy. Soc. Queensland 53: 223. 1942 [= *Psychotria* sp. (van Beusekom, 1967)].

Gaertnera capitata Bojer, Hortus Maurit. 216. 1837 [— *Chassalia capitata* DC. (Verdcourt, 1989; he considers these two different names, based on two different types)].

Gaertnera caerulea Bojer, Hortus Maurit. 217. 1837. *Gaertnera coerulea*, orth. var., cf. A. DC., Prodr. 9: 35. 1845 [= *Chassalia grandifolia* DC. (Verdcourt, 1989, as "*G. coerulea*")].

Gaertnera cymiflora Bojer, Hortus Maurit. 218. 1837 [— *Chassalia boryana* DC. (Verdcourt, 1989)].

Gaertnera ferruginea A. Chev., Explor. Bot. Afrique Occ. Franc. 1: 444. 1920, nom. nud. [— *Premna quadrifolia* Schumach. & Thonn., Verbenaceae (Petit, 1959a)].

Gaertnera hongkongensis Seem., Bot. Voy. Herald 384. 1857. *Sykesia hongkongensis* (Seem.) Kuntze, Revis. Gen. Pl. 2: 425. 1891. *Tsiangia hongkongensis* (Seem.) P. P. H. But, H. H. Hsue & P. T. Li, Blumea 31(2): 311. 1986 [— *Ixora chinensis* Lam. (Bridson, 2000)].

Gaertnera incarnata Bojer, Hortus Maurit. 217. 1837 [= *Chassalia lanceolata* (Poir.) A. Chev. subsp. *lanceolata* (Verdcourt, 1983)].

Gaertnera indica J. F. Gmel., Syst. Nat., ed. 13[bis], 2(1): 685. 1791 [— *Hiptage madablota* Gaertn., Malpighiaceae (Steudel, 1840)].

Gaertnera lasianthoides C. E. C. Fisch., Bull. Misc. Inform. Kew 1927: 209. 1927 [— *Psychotria rhinocerotis* Blume (van Beusekom, 1967)].

Gaertnera longipetiolata R. D. Good, J. Bot. 67(Suppl. 2): 105. 1929 [= *Psychotria gossweileri* E. M. A. Petit (Petit, 1959a, b)].

Gaertnera lushaiensis C. E. C. Fisch., Bull. Misc. Inform. Kew 1928: 411. 1928 [— *Chassalia lushaiensis* (C. E. C. Fisch.) C. E. C. Fisch., Bull. Misc. Inform. Kew 1931: 282. 1931].

Gaertnera morindoides Baker, Bull. Misc. Inform. Kew 1892: 83. 1892 [— *Morinda morindoides* (Baker) Milne-Redh. (Petit, 1959a)].

Gaertnera obtusifolia (DC.) Roxb., Fl. Ind., ed. 1832, 2: 369. 1832 [— *Hiptage obtusifolia* (Roxb.) DC. (Steudel, 1840)].

Gaertnera pangati Rheede ex Retz., Observ. Bot. 6: 24. 1791. *Gaertnera pongatii*, orth. var. [— *Sphenoclea zeylanica* Gaertn., Campanulaceae or Lobeliaceae (Steudel, 1840)].

Gaertnera racemosa (Cav.) Roxb., Pl. Coromandel 1: 19, t. 18. 1795. Basionym: *Molina racemosa* Cav., Diss. 9: 435, t. 263. 1790 [— *Hiptage benghalensis* (L.) Kurz, Malpighiaceae (Jacobs, 1955)].

Gaertnera richardii Drake, Bull. Soc. Bot. France 45: 355. 1898 [1899] [probably — *Psychotria* sp.].

No adequate material is available to confirm the identity of this species, but syntype specimens *J. M. C. Richard* 236 and *J. M. C. Richard* 657 (both P!) dry with a red-brown cast and have distinct marginal leaf veins that are characteristic of *Psychotria*.

Gaertnera rufinervis Stapf, Trans. Linn. Soc. London, Bot. 4: 183. 1894 [— *Psychotria* sp. (van Beusekom, 1967)].

Gaertnera violascens Ridl., J. Fed. Malay States Mus. 6: 164. 1915 [— *Psychotria* sp. (van Beusekom, 1967)].

Gaertnera zimmermannii K. Krause & Gilg, Bot. Jahrb. Syst. 48: 430. 1912 [— *Strychnos* sp., Loganiaceae (Petit, 1959a)].

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3. *Gaertnera aphanodioica* Malcomber
4. *Gaertnera arenaria* Baker
5. *Gaertnera aurea* Malcomber
6. *Gaertnera bambusifolia* Malcomber & A. P. Davis
7. *Gaertnera belumutensis* Malcomber
8. *Gaertnera bieleri* (De Wild.) E. M. A. Petit
9. *Gaertnera brevipedicellata* Malcomber & A. P. Davis
10. *Gaertnera calycina* Bojer
11. *Gaertnera capitulata* Malcomber
12. *Gaertnera cardiocarpa* Boivin ex Baill.
13. *Gaertnera cooperi* Hutch. & M. B. Moss
14. *Gaertnera crassiflora* Bojer
15. *Gaertnera cuneifolia* Bojer
16. *Gaertnera darcyana* Malcomber & A. P. Davis
17. *Gaertnera divaricata* (Thwaites) Thwaites
18. *Gaertnera diversifolia* Ridl.
19. *Gaertnera drakeana* Aug. DC.
20. *Gaertnera edentata* Bojer
21. *Gaertnera eketensis* Wernham
22. *Gaertnera fractiflexa* Beusekom
23. *Gaertnera furcellata* (Baill. ex Vatke) Malcomber & A. P. Davis
24. *Gaertnera gabonensis* Malcomber
25. *Gaertnera* × *gardneri* Thwaites
26. *Gaertnera globigera* Beusekom
27. *Gaertnera grisea* Hook. f. ex C. B. Clarke
28. *Gaertnera guillotii* Hochr.
29. *Gaertnera hirtiflora* Verdc.
30. *Gaertnera hispida* Aug. DC.
31. *Gaertnera humblotii* Drake
32. *Gaertnera ianthina* Malcomber
33. *Gaertnera inflexa* Baill.
34. *Gaertnera junghuhniana* Miq.
35. *Gaertnera kochummenii* Malcomber
36. *Gaertnera letouzeyi* Malcomber
37. *Gaertnera leucothyrsa* (K. Krause) E. M. A. Petit
38. *Gaertnera liberiensis* E. M. A. Petit
39. *Gaertnera longifolia* Bojer
40. *Gaertnera longivaginalis* (Schweinf. ex Hiern) E. M. A. Petit
- 40a. *Gaertnera longivaginalis* var. *bracteata* (E. M. A. Petit) Malcomber
- 40b. *Gaertnera longivaginalis* (Schweinf. ex Hiern) E. M. A. Petit var. *longivaginalis*
41. *Gaertnera lowryi* Malcomber
42. *Gaertnera macrobotrys* Baker
43. *Gaertnera macrostipula* Baker
44. *Gaertnera madagascariensis* (Hook. f.) Malcomber & A. P. Davis
45. *Gaertnera microphylla* Capuron ex Malcomber & A. P. Davis
46. *Gaertnera monstrosa* Malcomber
47. *Gaertnera obesa* Hook. f. ex C. B. Clarke
48. *Gaertnera oblanceolata* King & Gamble
49. *Gaertnera obovata* Baker
- 49a. *Gaertnera obovata* Baker var. *obovata*
- 49b. *Gaertnera obovata* var. *sphaerocarpa* (Baker) Malcomber
50. *Gaertnera paniculata* Benth.
51. *Gaertnera pauciflora* Malcomber & A. P. Davis
52. *Gaertnera pendula* Bojer
53. *Gaertnera phanerophlebia* Baker
54. *Gaertnera phyllosepala* Baker
55. *Gaertnera phyllostachya* Baker
56. *Gaertnera psychotrioides* (DC.) Baker
57. *Gaertnera ramosa* Ridl.
58. *Gaertnera raphaelii* Malcomber

Appendix 1. Index to numbered collections.

Specimens are listed alphabetically according to the principal collector, with unknown collectors excluded. Numbers in parentheses correspond to the number of the species in the text and in the List of Species below. Asterisks indicate type collections. Dorr (1997) presented additional information on many collectors in Madagascar. Some collectors use only one name and therefore have no initials; others without initials here have not been traced.

LIST OF *GAERTNERA* SPECIES AND VARIETIES RECOGNIZED IN THIS REVISION

1. *Gaertnera alata* Bremek. ex Malcomber & A. P. Davis
2. *Gaertnera alstonii* Malcomber

59. *Gaertnera rosea* Thwaites ex Benth.
60. *Gaertnera rotundifolia* Bojer
61. *Gaertnera schatzii* Malcomber
62. *Gaertnera schizocalyx* Bremek.
63. *Gaertnera spicata* K. Schum.
64. *Gaertnera sralensis* (Pierre ex Pit.) Kerr
65. *Gaertnera ternifolia* Thwaites
66. *Gaertnera trachystyla* (Hiern) E. M. A. Petit
67. *Gaertnera vaginans* (DC.) Merr.
68. *Gaertnera vaginata* Lam.
69. *Gaertnera viminea* Hook. f. ex C. B. Clarke
70. *Gaertnera walkeri* (Arn.) Blume

Abang Mohtar S 41768 (18), S 52719 (18); Abraham, J. P. SF25874 (49a), SF7811 (42), SF7997 (49b); Abu Nawas A 834 (34); Adam MAU 11606 (56); Adam, J.-G. 124 (40b), 3658 (40b), 4697 (40a), 5997 (50), 6043 (50), 16307 (13), 20579 (40b), 22252 (50), 22405 (50), 27518 (40b), 28771 (40a), 28815 (50), 29544 (50), 29749 (50), 29876 (50); Adames, P. 568 (50); Aké Assi, L. 654 (5), 673 (5), 15130 (50), 15881 (5), 17797 (13), 19063 (50); Akondrovao SF 26415 (58); Alphonse [no initial; Dorr, 1997] RN 8677 (49a); Alston, A. 13252 (2); Amin, G. 86356 (34), SAN 95125* (2), SAN 97444 (34); Anderson, J. A. R. 8356 (34), SAR 9863* (26); Anderson, J. W. 19 (48); Andrianansata 158 (31); Armand, W. 6 (49b), 26 (58); Armange [no initial] 15 (68); Ashton, P. S. BRUN 165 (34), 192 (18), 916 (65), 16599 (18), 17970 (34); Asonganyi 161 (66), 34 (40b); Attie 11 (68); Aubréville, D. 81 (50), 1134 (50), 733 (50); Audru, J. 29996 (50).

Badré, F. J. 763 (68); Bakshi 184 (40a); Balakrishnan, N. 528 (17), 548 (65), 969 (67); Baldwin, J. T. 9833 (50), 10797 (13), 10928 (13), 11121 (13), 11554 (50), 13057 (50); Bamps, P. 379 (40b), 2041 (5), 2263 (40b); Barker 1267 (13); Barkly 536 (68), 630 (68), 1156 (56), 1374 (56); Barnes, E. SING 10889 (57); Baron, R. 149* (49a), 158 (44), 366 (44), 400 (44), 800 (42), 1233* (49b), 1243* (49b), 1267 (44), 1290 (54), 1328 (44), 1352 (44), 1533 (55), 1920* (54), 1922* (43), 1945* (42), 2217 (44), 2327* (55), 2372* (53), 2406 (31), 2683 (55), 2982* (53), 5010 (31), 5956 (42), 5958 (42); Bates, G. 516* (66), B10584 (34); Beaman, J. 8215 (18), 8271 (18); Beaujard [initial unknown; Dorr, 1997] 183 (42), 184 (43), 387 (42); Beccari, P. B. 1799* (62); Beddome, R. H. 5309 (70), 5310 (70); Beentje, H. 568 (5); Béjué 2971 (5); Bélanger, C.-P. 5A (39), 101 (14); Bellay, G. du 232* (50); Benoist, R. 297 (49a), 1520 (42); Bequaert, J. 106 (40b), 176 (13), 186 (50), 6870 (8); Bernardi, A. L. 11097 (49a), 11535 (58), 14503 (68), 14536 (68), 14714 (56), 14740 (56), 14778 (56), 14794 (20), 14794B (56), 14977 (68), 15035 (68), 15989 (65); Best, G. A. 7850 (47); Bijoux, F. M. MAU 1094 (60), MAU 1627 (10), MAU 2734 (52), MAU 2753 (10); Billiet 437 (68), 452 (68), 479 (68), 563 (68), 832 (68); Birkill, SING 234 (47); Birkinshaw, C. 117 (4), 296 (49b); Blackburn, E. B. 3370 (10); Boivin, L.-H. 1219 (68), 1778* (33), 1779 (43), 1780* (53), 2074* (4); Bojer, W. 68 (52); Bos, J. J. 2026 (13), 2984 (13), 3166 (66), 3982 (66), 4429 (66), 5358 (66), 5766 (66), 6340 (8), 6570 (66); Bosser, J.-M. 182 (49b), 6722 (44), 8200 (44), 9453 (68), 11621 (68), 12839 (44), 14413 (49b), 20811 (68); Botoalina, M. RN 3192 (53), RN 3734 (31), RN 6077 (54); Bouet, Dr. 8 (63); Boukouko Station Team 330 (50), 1974 (50); Bouton, L. S. MAU 1080 (20), 1085 (52); Boyer, G. 59 (68); Bremer, B. 895 (59), 1006 (65), 1051 (70); Brenan, J. 8934 (50); Breteler, F. 344 (66), 382 (66), 389 (63), 1626 (40b), 5458 (40a), 5533 (50), 5974 (50), 6275 (50), 7651 (40b), 8029 (24), 10214 (24), 12496 (40b); Breyne 94 (50), 3081 (40a), 3417 (40a); Brown, R. C. 958 (50); Brummitt, R. 13918 (50); Bünnemeyer, H. A. B. 1995 (27), 6512 (27),

7686 (34); Burgess FRI 9100 (18); Burkill, I. 52 (18), 136 (69), 1895 (47), SING 7613 (27), 7823 (18), 8521 (18), 8608* (18), 12902 (48); Burley 1157 (34), 3066 (34); Burt, B. D. 88 (65); Buwalda, P. 6680 (34).

Cadet, L. J. T. 54 (68), 592 (68), 698 bis (68), 1179 (68), 3814 (68), 3859 (68); Cadinouche MAU 22552 (56); Caille, O. 14794 (50), 14992 (50); Callens, H. 3247 (8), 3409 (8); Cantley, N. 67 (47), 159 (27); Cantley's Collector 164 (27); Capuron, R. [P.R.] SF 255 (49a), SF 568 (55), 1641 (44), SF 20287 (44), SF 23220 (51), SF 23658 (53), SF 23658 bis (28), SF 23800 (46), SF 23805 (33), SF 23845 (53), SF 24022 (45), SF 24027 (44), SF 24065 bis (33), SF 24355 (45), SF 24413 (44), SF 24770 (45), SF 24978 (32), SF 28160 (68), SF 28204 (68), SF 28260 (20), SF 28266 (60), SF 28396 (46), SF 28774 (44); Carmichael, D. 12 (68); Catat, L. D. M. 2524 (33); Chalot, C. 29 (63); Chang SA 5 (27); Chapman, J. D. 3992 (50), 5247 (50); Chatelain, C. 2 (5), 538 (5); Chevalier, A. J. B. 11206 (50), 12420 (40a), 12664 (40a), 12936 (40a), 12984 (40a), 17142 (50), 17159 (40b), 17250 (5), 17542 (5), 22774 (50), 27743 (40b); Chew 735 (57); Chillou, J. 800 (50); Christiaensen 1790 (37); Christophe, R. RN 8044 (32); Church 1768 (18); Clayton 6101 (65); Clemens, J. 40466 (34); Comanor 1200 (67); Commerson, P. 371 (10); Coode, M. J. E. 4283 (56), 4765 (56), 4824 (52), 4892 (68); Cooper, G. P. 202 (13), 277* (38), 287* (13), 465 (13); Corbisier-Baland, A. 1120 (40b), 1266 (50), 1385 (40b), 1917 (40b), 1930 (50); Corner, E. J. H. SFN 32507 (62), SING 29968 (69); Coudreau, J. 84 (54), RN 50 (55); Cours, G. 1129 (53), 1203 (23), 1843 (55), 1870 (53), 1926 (16), 1943 (28), 1958 (54), 2286 (44), 2373 (55), 2405 (53), 2439 (54), 2543 (55), 2579 (53), 2772 (53), 2914 (42), 3167 (49b), 3203 (4), 3615 (32), 4177 (44), 4182 (55), 4363 (44), 4414 (55), 4425 (44), 4509 (31), 4790 (49b), 4804 (55), 4879 (43), 4893 (53); Coûteaux, G. 22 (50), 94 (50), 118 (40b); Cramer 4395 (65), 4506 (70), 4641 (70); Croat, T. B. 32246 (55), 32579 (28), 32604 (43), 32613 (54), 32647 (54).

D'Alleizette, C. 1353 (44), 1477 (55); D'Arcy, W. G. 15273 (54); D'Argent, G. MAU 21399 (56), MAU 22454 (56); Daramola, B. O. 451 (50), FHI 72488 (50); Debeaux, G. 412 (50); Decary, R. 111 (33), 1949 (32), 5200 (43), 6907 (55), 7085 (55), 10135 (49b), 10814 (58), 11018 (58), 11066 (28), 14342 (58), 14790 (49b), 15297 (55), 16786 (54), 16916 (28), 16917 (42), 16935 (54), 16952 (42), 16975 (42), 16976 (42), 16982 (4), 17694 (55), 17713 (28), 17770 (42), 17783 (55), 18428 (53); Dechamps, R. 13067 (50); De Giorgi, S. 258 (40b), 271 (50); De Graer, P. 348 (40a); Deighton, F. C. 1663 (40b); Demange, R. 3036 (50); de Néré [no initial] 1172 (50), 1355 (50); Dequaire 27657 (54), 27677 (55), 27726 (51), 27977 (23); Derleth 118 (43); Descoings, B. 180 (55), 1841 (55), 8282 (40b), 8539 (40a), 8664 (40b); Deshamel MAU 81 (56); de Silva, F. W. de 10 (70), 19 (25), 52 (70); Desvaux, A.-N. 36 (68); Dhetchuvi 964 B (40a); Dibata, J. 1097 (50); Dinklage, M. J. 2986 (13), 3056 (13); Dorr, L. 3080 (55), 3222 (42), 4484 (43); Doumenge 411 (8); Dowsett-Lemaire 1936 (50); Duah 5823 (4); Dumetz, N. 858 (28), 914 (12); Du Petit-Thouars, P. 100 (10).

Edgerley, L. F. REU 13371 (68); Ekwuno [no initial] 284 (50); Enti, A. A. GC 35586 (50), GC 42614 (50), GC 42670 (5), SP 258 (5), SP 346 (5), SP 599 (5); Evrard, C. M. 2827 (37), 2893 (37), 3901 (40a), 4932 (40b), 6083 (40b), 6223 (8), 6327 (50), 6448 (40b), 6618 (40b), 11243 (55); Exell, A. 708 (40b).

Faden, R. 76/503 (17), 77/42 (67); Fanja 539 (55); Fay, J. M. 8106 (50), 8111 (50); Fedilis SAN 94840 (34); Fleury, F. 26727 (50); Florens, D. MAU 22551 (56), MAU 22711 (56), MAU 22725 (15); Forbes 3214 (34); Forsyth-Major, C. I. 304 (49a), 317 (44), 401a (44); Fosberg, R. 56500 (59); Fotius

2690 (50); Friedmann, F. 555 (68), 933 (68), 2247 (68), 2845 (52), 2984 (52), 3023 (56), 3335 (68).

Gachet, C. SF 7531 (53); Gardner, G. 581 (70), MAU 19158 (56); Garnier, I.? 228 (68); Gautier, L. 2514 (43), 2807 (4), 2817 (53); Gautier-Beguín, D. 1032 (13), 1107 (50), 1263 (40a); Geay, [M.]F. 7370 (4), 7638 (42), 7719 (28); Geerling, C. 420 (50), 422 (5), 1689 (50); Gentry, A. H. 11575 (32); Gereau, R. E. 3236 (4); Germain, R. G. A. 2067 (50), 7551 (37), 8501 (40a); Gerrard, W. T. 37 (53), 54* (43); Gilbert, G. C. L. 14173 (50), 14813 (50); Gillet, J. 2809 (40a); Goodenough, J. S. 1630 (47), 4827a (69); Goossens, V. G. 2688* (40a), 5017 (8), 6197 (40b), 6208 (50); Gossweiler, J. 14108 (50); Gueho, J. MAU 15194 (56), MAU 17853 (52); Guillot, J. 27* (33), 36* (28), 38 (43).

Hallé, F. 4 (5), 146 (50), 217 (5), 284 (5), 296 (5), 380 (40a), 409 (4), 418 (13); Hallé, N. 2010 (18), 4437 (66), 4617 (66), 4664 (66); Hallé, W. 4664 (66); Haniff, M. SING 7947 (57), SING 21055 (48); Harder, D. K. 3751 (40b), 3753 (50); Hardial 628 (27); Harley, R. M. 1035 (40b); Harley, W. 1910 (40a); Harris, D. J. 3176 (40b); Hart, T. 319 (37); Hassan S 2200 (3), S 4928 (3); Haviland, G. D. 3460 (34); Henderson, M. R. 11476 (18), 17769 (57), SING 23390 (57); Hepper, F. N. 1514 (50), 4545 (67); Hill, H. C. 383 (27), 397 (27), 424 (27), 425 (27), 470 (27); Holttum, R. E. 53 (7), 10687 (7), SING 19944 (47); Homolle, A. M. 61 (42), 1843 (55), 1926 (16), 1958 (54), 2286 (44), 2373 (55), 2405 (53), 2543 (55); Hoogland, R. D. 11406 (67), 11451 (67); Hou 619 (48), 649 (48); Huber 582 (17), 825 (70); Hullett, R. W. 113 (47), 756 (57); Humbert, J. H. 3366 (58), 3450 (43), 3566 (16), 3578 (44), 3582 (49a), 5999 (28), 6056 (58), 6250 (49b), 6322 (49b), 17480 (49a), 17618 (53), 17829 (49a), 18201 (49a), 20600 (54), 21997 (32), 22019 (49b), 22024 (32), 22026 (55), 22045 (32), 22106 (55), 22114 (43), 22118 (49a), 22283 (53), 22429 (32), 22796 (32), 22817 (32), 23043 (55), 23106 (32), 23367 (31), 23506 (51), 24117 (49a), 24338 (43), 24378 (28), 24504 (32), 24621 (43), 28500 (49b), 31467 (53), 31669 (53), 31746 (43), 31885 (51); Humblot, [J.-H.]L. 503 (54), 504 (54), 510* (55), 655* (31); Hunter, K. L. 28 (50).

Ilias, B. P. S 39183 (18); Imbert, T. 94 (28).

Jaamal KEP 36172 (57); Jacques-Félix, H. 795 (40a), 2444 (50), 8799 (50); Jaeger, P. 1166 (40b), 1290 (50), 1665 (50), 7158 (40a), 7607 (50), 7688 (50), 7832 (50); Jansen, J. W. A. 754 (13), 1071 (13), 1119 (50), 1515 (40a), 1615 (13), 1650 (13), 2468 (13); Jaofety-Bosy [no initial; Dorr, 1997] RN 10096 (43); Jayasuriya 800 (17), 916 (70), 1509 (17), 2841 (25), 2961 (70), 2970 (70); Jeffrey, C. 231 (8); Jolly, A. 134 (63); Jongkind, C. 878 (49a), 2077 (4), 2085 (4), 4982 (13); Jumali, K. 3004 (7), 3054 (7).

Kahindo SF 116 (40b); Kalong, F. G. KEP 20457 (57); Kamarudin FRI 28767 (34); Kelsall, H. J. 1995* (17); Kenfack, D. 763 (36); Kerr, A. 15454 (64), 17764 (64), 17798 (64), 17996 (64), 19137* (34); Khairuddin, K.-D. FRI 32848 (7); Kiah, M. S. SFN 32015 (62), SING 32110 (47); Kiener, A. SF 5047 (28); Kiew 2192 (7), 2197 (18); King's Collector 8449* (48); Klaine, R. P. 52 (63), 149 (63), 202 (63), 203 (50), 393 (63), 421 (63), 516 (63), 872 (63), 1661 (63), 1769 (50); Kloss, C. B. 5963* (34); Kochummen, K. M. FRI 2311 (18), FRI 2387* (35), FRI 16671 (18), FRI 32515 (34); Kostermans, A. J. G. H. 238 (34), 1315 (34), 9252 (34), 23597 (59), 23659 A (70), 23662 B (70), 24101 (67), 24142 (65), 24210 (65), 24213 (65), 24713 (65), 25017 (70), 27020 (65), 27135 (17), 27527 (17), 27573 (65), 28274 (70); Kotozafy, A. 267 (42), 1073 (9); Kramer, [F. or W. H. de; which is unknown] 9220 (68).

Laibosaka, R. RN 10945 (31), RN 12597 (43), RN 10926 (55); Lalouette, J.-A. MAU 10010 (60); Lam, H. J. 5530 (33),

5220 (68), 5628 (54), 5628A (49b), 5720 (33); Langlassé, E. 198 (47); Larsen 58 (64); Leandri, J. D. 3204 (44); Lebrun, J. 331 (8), 739 (8), 1452 (50), 5688 (8), 5772 (8), 6271 (37), 6332 (37), 6414 (37); Lee, B. S 45386 (11); Leeuwenberg, A. J. M. 1814 (5), 2366 (5), 3798 (5), 4154* (5), 4840 (13), 5074 (8), 5350 (8), 5534 (66), 5687 (66), 5710 (50), 7106 (50), 7677 (50), 7992 (5), 8889 (50), 10352 (50), 11508 (40b), 14017 (58); Léonard, J. 84 (50), 137 (50), 2914 (37), 3743 (8); Leroy, J.-F.[P.] 8 (63); Lesmy FRI 35937 (47); Le Testu, G. 1642 (24), 7622 (40b), 8575* (24), 8642 (50), 9143 (40b), 9572 (40b); Letouzey, R. 2116 (40b), 2498 (50), 3780 (40b), 12457 (50), 12601 (40b), 12648 (66), 13702* (36), 14153 (36), 14907 (66), 15091 (50), 15223 (66); Lewis, B. 756 (58), 786 (55), 819 (58), 1030 (49a), 1253 (32), 1306 (49a), 1318 (32); Liengola 157 (37); Linder, D. H. 286 (13), 758 (40a), 1487A (13), 1487B (13); Lisowski, S. 16116 (8), 18904 (8), 45071 (8), 52450 (8), 90036 (8), 90039 (8); Lorence, D. H. 1495 (56), 1541 (56), 1548 (60), 1597 (56), 1956 (56), 2125 (56), 2201 (20), 2209 (56), 2224 (39), 2415 (68), 2674 (39), 4449 (56), 4490 (56), M 278 (15), M 281 (56); Louis, A. M. 909 (37), 1309 (50), 1344 (66), 1680 (63); Louis, J. 944 (40b), 1881 (40b), 1896 (50), 2006 (50), 2252 (37), 2305 (37), 9169 (40b), 9979* (37), 11211 (37), 11586 (37), 12577* (40b); Lourteig, A. 2459 (68); Lowe, J. 3623 (50); Lowry, P. P. 4036 (41), 4127 (12), 4155 (41), 4181 (30), 4262 (55), 4272 (42), 4283* (45), 4471 (12), 4486A (12); Lyall, R. 161 (55), 193 (55).

Macrae, J. 602 (70); Madani SAN 107944 (2); Maingay, A. C. 2701 (47), 925 (47); Malcomber, S. T. 930 (4), 999 (58), 1018* (58), 1065 (49a), 1152 (4), 1172 (58), 1275 (4), 1460 (49a), 1799 (4), 1946 (4), 2027 (34), 2028 (34), 2155 (58), 2173 (4), 2229 (4), 2585 (42), 2589 (55), 2594 (43), 2637 (4), 2676 (43), 2705 (43), 2709 (43), 2710 (32), 2733 (55), 2742 (41), 2758 (59), 2759 (59), 2760 (67), 2761 (67), 2762 (17), 2763 (67), 2764 (70), 2765 (70), 2766 (65), 2767 (65), 2768 (25), 2769 (25), 2770 (70), 2771 (70), 2772 (51), 2773* (32), 2774 (43), 2776 (49a), 2777 (43), 2778 (43), 2779 (51), 2780 (51), 2781* (51), 2782 (43), 2783 (49b), 2786 (49a), 2788 (49b), 2789 (49b), 2793 (49a), 2795 (32), 2799 (49a), 2800 (41), 2802 (19), 2803 (12), 2807 (43), 2812 (4), 2814 (54), 2815 (4), 2817 (30), 2818 (30), 2819 (49a), 2820 (12), 2821 (55), 2822 (19), 2824 (30), 2825 (61), 2827* (41), 2829 (61), 2830 (53), 2833 (53), 2834 (43), 2836 (49b), 2837 (49b), 2838 (49a), 2839 (49b), 2840 (49b), 2857 (49b), 2859 (49b), 2865 (44), 2866 (55), 2867 (9), 2869 (49a), 2870 (44), 2875 (58), 2876 (9), 2877* (9), 2878 (58), 2881 (49a), 2882 (49a), 2884 (28), 2885 (28), 2886 (33), 2887* (46), 2888 (41), 2897 (30), 2900 (33), 2901 (33), 2909 (46), 2910 (54), 2911 (43), 2912 (28), 2913 (28), 2914 (49a), 2915 (43), 2916 (49b), 2917 (49b), 2918 (49b), 2919 (49b), 2920 (43), 2921* (16), 2922 (16), 2925* (45), 2926 (49a), 2927 (55), 2928 (49b), 2929 (49b), 2930 (56), 2931 (56), 2932 (39), 2933 (52), 2934 (29), 2935 (39), 2936 (52), 2937 (29), 2938 (56), 2939 (56), 2940 (15), 2941 (20), 2942 (20), 2943 (20), 2944 (20), 2945 (20), 2946 (56), 2947 (56), 2948 (20), 2949 (60), 2950 (20), 2951 (20), 2953 (20), 2954 (20), 2955 (60), 2956 (20), 2957 (56), 2958 (56), 2959 (20), 2960 (20), 2961 (20), 2962 (20), 2963 (20), 2964 (49b), 2965 (34), 2966 (4), 2967 (34), 2968 (34), 2971 (3), 2977 (34), 2978 (34), 2979 (34), 2981 (34), 2983 (34), 2984 (34), 2985 (34), 2986 (3), 2987 (3), 2988 (3), 2989 (3), 2990 (3), 2991 (3), 2992 (3), 2993 (3), 2994 (3), 2995 (3), 2996 (3), 2997 (3), 2998 (3), 2999 (3), 3000 (3), 3001 (34), 3002 (34), 3003 (34), 3004 (34), 3005 (34), 3006 (34), 3007 (47), 3008 (27), 3009 (27), 3010 (69), 3011 (57), 3012 (57), 3013 (57), 3016 (57), 3017 (57), 3018 (18), 3019 (18), 3020 (18), 3021 (48), 3022 (48), 3023 (7), 3024* (7), 3025 (47), 3026 (62), 3031 (34), 3033 (22), 3037 (11), 3038

(26), 3039 (48), 3040 (48), 3044 (34), 3045 (34); Mann, G. 1791* (66); Manning, S. 1704 (8), 2200 (50); Manohiraza [no initial; Dorr, 1997] RN 8709 (55); Marmo, V. 18 (40a), 19 (40b); Martin, S. 38199 (34); Mat [no initial; Vegter, 1976] 3723 (7); Mat-Salleh, K. 3250 (34); Maxwell, J. F. 78-339 (27), 78-386 (27), 81-75 (27), 81-159 (27), 985 (67); McPherson, G. 14146 (28), 16334 (50), 16292 (50), 16360 (53), 16553 (43); Meijer, W. 982 (17), 11241 (34), SAN 21809 (3); Melville, F. A. 613 (50); Mengé, A. 38 (8); Merello, M. 1285 (4), 1412 (4); Messmer, N. 690 (1), 692 (1); Mildbraed, G. W. J. 3206* (37), 3287* (37); Miller, J. S. 3818 (42), 3821 (55), 3918 (55), 3978* (6), 4050 (32), 4189 (32), 4488 (53), 4667 (32), 4483 (51); Mocquerys, A. 155 (30), 167* (30), 197 (4), 221 (53), 273* (19), 349 (54); Mogeia 3457 (11); Moise [no initial] 2 (28), 5 (34), 6 (54), 9 (61), 10 (53), 11 (30); Morat, P. 2746 (68), 3215 (49a), 4150 (43), 8576 (42), 8587 (30), 8611 (42), 8613 (30); Morton, J. K. GC 8473 (13); Moureau, J. 14 (40b); Moysoy, L. SING 31022 (57); Mpom, B. 334 (40b); Muin Chai SAN 29840 (34); Murata B-668 (34); Muslim Plant Collector 19 (25).

Ndjele 731 (8), 735 (8); Ng, F. S. P. FRI 1935 (18), FRI 22056 (18), FRI 22075 (69), FRI 5233 (47), FRI 5893 (57), FRI 6081 (48); Nickille 4816 (57); Nicoll, M. F. 105 (58), 106 (58), 170 (49a), 202 (55), 464 (54), 616 (32); Nielson 1059 (34); Noor, M. 1504 (27); Nooteboom, H. P. 1526 (18), 3122 (65), 3123 (70), 3212 (17), 4324 (18); Nur, M. 7765 (69), 7807 (47), 11174 (18), 11613 (18), SING 34357 (48).

Okeke, R. FHI 38440 (50); Oldeman, R. 240 (5), 468 (50); Onochie, C. F. A. FIH 33168 (21); Othman, S. 19909 (34); Overdorff, D. 24 (55).

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Rabevohitra, A. R. 2159 (28), 2578 (55), 2587 (43), 4195 (28), SF 29307 (28), SF 29861 (43); Rafamantanantsoa, G. OUEM 31 (33); Rahajaso, G. M. 1089 (61), 923 (61); Raharimalala, V. 145 (42), 193 (54), 317 (28), 1502 (19), 1502 (33), 2151 (33); Rahmat Si Boeea [or Rahmat Si Toroës, no initial; Vegter, 1983] 5418 (34), 5722 (34); Raimundo, A. R. F. 2846 (50); Rajanaparany [no initial; Dorr, 1997] RN 8162 (53); Rakoto, E. RN 1487 (49a); Rakotomalaza, P. J. 1317 (49b); Rakotoniaina RN 2426 (54), RN 2446 (54), RN 2448 (53), RN 2451 (54), RN 3218 (49b); Rakotovao RN 6841 (58), RN 8509 (58), RN 8518 (44), RN 9601 (49b), RN 9602 (53); Rakotovao, C. 108 (58); Rakotovao, G. 537 (58), 593 (49b), 607 (49b); Rakotozafy, A. 521 (33); Ralaikoto 197 (53); Ralarivohita SF 1103 (28); Ramanatsoavina, G. RN 2814 (55); Ramarokoto, M. RN 9469 (55); Randriamampionona, B. 45 (58); Randrianasolo, A. 70 (55), 288 (28), 320 (31); Ranjokiny, A. M. RN 8860 (28), RN 10845 (54); Rasoavimbahoka, F. 69 (52); Ratovoarison, F. D'A. RN 1317 (55), RN 1338 (55); Ratsirahonana, L. J. SF 15372 (58); Ravelonarivo, D. 680 (6), 903 (53); Raynal, J. 21012 (50); Razafimanantsoa, A. RN 1563 (4); Razali Salam 109 (18); Reitsma, J. 1336 (63), 2603 (66), 2645 (50), 3131 (66); Rena, R. S 60874 (34); Rena George S 40507 (34), S 58327 (11); Reygaert, F. J. 624 (37); Richard, J. M. C. 5* (33), 26 (33); Richards, P. W. 3249 (50); Richardson, I. B. K. 4046 (56),

4078 (60), 4090 B (68), 4102 (68), 4148 (68); Ridley, H. N. 13 (69), 179 (69), 1440 (47), 2679 (27), 2679a (27), 2680 (47), 3869 (69), 3892 (47), 4000 (69), 4828 (69), 4828a (69), 4828b (69), 7429* (18), 8565 (48), 8923 (69), 9500 (69), 10943 (69), 11123 (27), 12080* (18), 12528 (27), 13337 (27), 13666 (57), 16255* (18); Ridsdale, C. 1934 (70), 1935 (70), 1943 (70), 2041 (65); Roajanoparary SF2830 (42); Roberty, G. 12815 (50), 13611 (50), 15361 (13); Robinson, H. G. 5488* (57), 6275 (34); Robyns, F. H. E. A. W. 1237 (40b), 6904 (70); Runi, Y. P. C. S 59673* (11), S 62906 (34).

Sajy, C. RN 8841 (55); Saw FRI 34247 (18); Schatz, G. E. 1228 (58), 1335 (30), 1348 (54), 1542 (4), 1661 (33), 1866 (41), 1875 (31), 2425 (58), 2432 (55), 2620 (31), 2705 (12), 2808* (61), 2885 (54), 3080 (54), 3211 (49a), 3314 (30), 3346 (30), 3604 (42); Schlechter, R. 12549 (50), 12586* (40b); Schlieben, H.-J.E. 10921 (68), 8023 (43); Schnell, R. A. A. 1123 (50), 4093 (40a), 6291 (40b); Schoenmaker 117 (24); Schweinfurth, G. A. 3552* (40b); Scortechini 253* (48); Scott-Elliott, G. F. 1774 (55), 1781 (54), 2171 (55); Seigler, D. S. 12802 (43); Service Forestier de Cote Ivoire 381 (13); Shah, M. 2091 (27), 2204 (7), 2463 (27), 2789 (18), 3024 (57), 3090 (47), 3894 (27), 4208 (27); Sibak ak Luang S 21999 (11); Sieber, F. W. 52 (10), 54* (56), 55* (10), 57* (56), 188 (10), 272* (56), 332* (56), 335* (56); Silasy [i.e., Silizy, no initial; Dorr, 1997] RN 9501 (53), RN 9509 (55), RN 9512 (4); Simons, E. L. A. N. 408 (50), 547 (50); Simpson, D. A. 88/29 (53); Simpson, N. 9493 (67), 9883 (65); Sinclair, J. 4926 (27), 5125 (47), 5325 (69); Singh, J. SAN 20923 (34); Smythies, S. 5909* (3); Sohmer, S. 8677 (65), 8701 (65), 8769 (67), 8797 (67), 8930 (67), 9884 (65), 10231 (67), 10244 (67), 10288 (67), 10374 (17), 10461 (70), 10611 (70); Sonké, B. 2687 (50), 2918 (66), 2919 (40b), 2920 (66), 2921 (40b), 2923 (66), 2935 (66), 2946 (66), 3044 (50), 3106 (66), 3197 (66), 3251 (66), 3253 (66), 3293 (8), 3318 (66), 3663 (66), 3674 (66), 3934 (66), 3959 (66), 4013 (66), 4014 (66), 4179 (66), 4486 (8), 4541 (8); Soyaux, H. 24* (63), 28 (66), 178* (63); St. Clair-Thompson, G. 3586 (50); St. John, H. 26529 (68); Staub, F. MAU 11986 (56), REU 11107 (68); Stäuble 186 (13), 353 (13), 857 (13); Suhaili Hj. Zinin BRUN 15022 (34); Sumbing SAN 101357 (2); Sumithraarachichi 196 (65), 566 (70); Suppiah, T. FRI 17806 (7), FRI 17830 (7), FRI 17844 (7), KEP 98965 (69), KEP 98992 (47); Symington, C. F. 32250 (57), KEP 31454 (57), s.n. (57), SING 28865 (69).

Tachun bin Bara KEP 33613 (48); Talbot, P. A. 3005 (50), 3391* (21); Tan 8 (27); Tang 1170 (47), 1684 (34); Teijsmann, J. E. [also "Teysmann"] 10358 (27), 10732 (27), 19390 (27), 19428 (27); Theobald 2378 (17); Thollon, F.-R. 81 (40b); Thomas, D. 484 (66), 4398 (8), 6225 (40b), 6856 (8), 8117 (8), 8649 (50); Thomas, N. 1033 (40b), 2945 (50); Thwaites, G. H. K. CP 45* (65), CP 346* (25), CP 288 (70), CP 346 (25), CP 363* (25), CP 440* (65), CP 457* (65), CP 2673* (59), CP 2991* (17); Tirvengadam, D. D. 11 (68), 19 (68), 28 (20), 379/29 (56), 387/37 (56), 394/44 (20), 396/46 (56), 947 (60), 969 (15); Toutain, B. 2408 (50); Traub, Z. D. 334 (50); Troupin, G. 9165 (8), 9225 (8), 10931 (8); Turk, D. 421 (58).

Van Balgooy, M. M. J. 4052 (34), 6062 (34); van Beusekom, C. F. 839 (64), 1547 (70), 1552 (65), 1739 (64), 2666 (27); van der Maesen 5454 (63); van der Werff, H. 13526 (43); Vanderyst, H. J. R. 10337 (37); van Harten, A. M. 349 (13); van Meer, P. P. C. 110 (13), 121 (50), 1174 (21), 1185 (8); van Nek, I. 569 (24), 2107 (54); Vasey 32 (53); Vaughan, R. E. 3031 (60), MAU 1084 (52), MAU 1636 (20), MAU 1640 (20), MAU 1655 (60), MAU 3144 (15), MAU 10387 (39), MAU 11028 (52), MAU 11894 (15), MAU 12239 (20), MAU 12271 (60), MAU 12507 (20), MAU 13042 (29),

MAU 13163 (15), MAU 13751 (56), MAU 13761 (56), MAU 14123 (39), MAU 14191 (20), MAU 14222 (20); Vermeulen [J. or P., which is unknown] 794 (18); Versteegh, C. 50 (5); Vigne, C. 1948 (13); Vigreux, M. 15373 (49b); Villiers, J.-F. 247 (63); Vogel, S. 70* (50), 71* (50); Voorhoeve, A. 823 (13).
Waas, S. 52 (17), 888 (67), 1190 (67), 1316 (17), 1335 (59), 1465 (59), 1483 (70), 1511 (17), 1693 (65), 1768 (59), 1799 (59), 1840 (70), 2043 (59); Walker, F. S. KEP 33831 (7); Walker, G. W. 58* (67), 102* (70), 212 (47), 223 (70); Wallich, N. 8328* (47), 8342* (34), 8354* (69), 8374* (34), 8389* (27); Walters, G. 913 (50), 957 (50); Ward, C. 1841 (60); Waterlot, E. G. 335 (4); Watts, J. 1141 (8); White, F. 3311 (50); White, L. 1071 (50), ser. 2 335 (50); Whitmore, T. C. FRI 8726 (7), FRI 15457 (57), FRI 15503 (57), FRI 15584 (57), FRI 15585 (57); Wiehe, P. O. 1712 (68), 2746 (68); Wieringa, J. 1654 (24), 4040 (50); Wilde, J. de 135 (5), 572 (50), 637 (50), 3161 (5), 3618 (13), 8165 (40b), 8827 (66), 11449 (40b); Wilde, W. de 26 (5), 348 (5), 2917 (66), 3945 (50); Wilks, W. 72 (40b), 528 (40b); Wong, Y. K. 1088 (18), 1724 (34), FRI 28905 (48), FRI 28919 (48), FRI 28950 (48), FRI 30928 (18), FRI 32246 (18), FRI 32350 (57), FRI 32356 (18); Worthington, T. B. 1962 (70), 2287 (59), 3635 (59), 7183 (67); Wray, L. Jr. 25 (48), 1948* (48), 2283* (48), 4122 (57), 5343* (18).
Yii S 64422 (47).
Zamanivato [no initial; Dorr, 1997] RN 8252 (32), RN 8253 (55); Zenker, G. 1392 (40b), 1763* (66), 1838 (66), 2034 (66), 2252* (8), 2252a (8), 2393 (66), 3569 (66), 4207 (66), 4419 (8), 4547 (66), 4760 (66); Zjhra, M. 133 (54), 392 (41); Zollinger, H. 3051* (34).

Appendix 2. Index to names treated in this revision. Names in boldface are accepted for species of *Gaertnera* Lam.

| Name | Taxonomic identity |
|--|--|
| <i>Andersonia vaginata</i> Willd. ex Roem. & Schult. | – <i>Gaertnera vaginata</i> |
| <i>Chassalia clusiifolia</i> var. β [beta] DC., nom. ined. | – <i>G. rotundifolia</i> |
| <i>C. coffeoides</i> DC. | – <i>G. psychotrioides</i> |
| <i>C. psychotrioides</i> DC. | – <i>G. psychotrioides</i> |
| <i>Coffea chasalioides</i> D. Dietr., nom. superfl. illeg. | – <i>G. psychotrioides</i> |
| <i>Frutesca mauritiana</i> DC. ex Meisn. | identity unclear |
| <i>Gaertnera acuminata</i> Benth. | – <i>G. junghuhniana</i> |
| <i>G. acuminata</i> var. <i>montana</i> Ridl. | – <i>G. ramosa</i> |
| <i>G. acuminata</i> var. <i>oxyphylla</i> (Benth.) Ridl. | – <i>G. junghuhniana</i> |
| <i>G. aetheonoma</i> Steud., nom. nud. | – <i>G. calycina</i> |
| <i>G. alata</i> Bremek. ex Malcomber & A. P. Davis | |
| <i>G. alstonii</i> Malcomber | |
| <i>G. aphanodioica</i> Malcomber | |
| <i>G. arenaria</i> Baker | |
| <i>G. aurea</i> Malcomber | |
| <i>G. australiana</i> C. T. White | – <i>Psychotria</i> L. sp. |
| <i>G. bambusifolia</i> Malcomber & A. P. Davis | |
| <i>G. belumutensis</i> Malcomber | |
| <i>G. bieleri</i> (De Wild.) E. M. A. Petit | |
| <i>G. bifida</i> Bojer | – <i>G. psychotrioides</i> |
| <i>G. boivinii</i> Drake | identity unclear |
| <i>G. borneensis</i> Valetton | identity unclear |
| <i>G. bracteata</i> E. M. A. Petit | – <i>G. longivaginalis</i> var. <i>bracteata</i> |
| <i>G. bracteata</i> var. <i>glabrifolia</i> E. M. A. Petit | – <i>G. longivaginalis</i> var. <i>bracteata</i> |
| <i>G. brevipedicellata</i> Malcomber & A. P. Davis | |
| <i>G. brevistylis</i> Ridl. | – <i>G. junghuhniana</i> |
| <i>G. caerulea</i> Bojer | – <i>Chassalia grandifolia</i> DC. |
| <i>G. calycina</i> Bojer | |
| <i>G. calycina</i> var. <i>variegata</i> Bojer | – <i>G. calycina</i> |
| <i>G. capitata</i> Bojer | – <i>C. capitata</i> DC. |
| <i>G. capitulata</i> Malcomber | |
| <i>G. cardiocarpa</i> Boivin ex Baill. | |
| <i>G. caudata</i> Ridl. | – <i>G. ramosa</i> |
| <i>G. chapelieri</i> Drake | identity unclear |
| <i>G. coerulea</i> , orth. var. | – <i>C. grandifolia</i> |
| <i>G. cooperi</i> Hutch. & M. B. Moss | |
| <i>G. crassiflora</i> Bojer | |
| <i>G. crassifolia</i> , orth. var. | – <i>G. crassiflora</i> |
| <i>G. crinita</i> Drake | – <i>G. phanerophlebia</i> |

Appendix 2. Continued.

| Name | Taxonomic identity |
|--|--|
| <i>G. cuneifolia</i> Bojer | |
| <i>G. cymiflora</i> Bojer | — <i>C. boryana</i> DC. |
| <i>G. darcyana</i> Malcomber & A. P. Davis | |
| <i>G. dinklagei</i> K. Schum. | — <i>G. trachystyla</i> |
| <i>G. divaricata</i> (Thwaites) Thwaites | |
| <i>G. diversifolia</i> Ridl. | |
| <i>G. drakeana</i> Aug. DC. | |
| <i>G. edentata</i> Bojer | |
| <i>G. eketensis</i> Wernham | |
| <i>G. ferruginea</i> A. Chev. | — <i>Premna quadrifolia</i> Schumach. & Thonn. (Verbenaceae) |
| <i>G. fissistipula</i> (K. Schum. & K. Krause) E. M. A. Petit | — <i>G. bieleri</i> |
| <i>G. fractiflexa</i> Beusekom | |
| <i>G. furcellata</i> (Baill. ex Vatke) Malcomber & A. P. Davis | |
| <i>G. gabonensis</i> Malcomber | |
| <i>G. ×gardneri</i> Thwaites | |
| <i>G. globigera</i> Beusekom | |
| <i>G. godefroyana</i> Cordem. | — <i>G. vaginata</i> |
| <i>G. grisea</i> Hook. f. ex C. B. Clarke | |
| <i>G. guillotii</i> (Hochr.) Bremek., hom. illeg. | — <i>G. inflexa</i> |
| <i>G. guillotii</i> Hochr. | |
| <i>G. hirtiflora</i> Verdc. | |
| <i>G. hispida</i> Aug. DC. | |
| <i>G. hongkongensis</i> Seem. | — <i>I. chinensis</i> Lam. |
| <i>G. humblotii</i> Drake | |
| <i>G. ianthina</i> Malcomber | |
| <i>G. incarnata</i> Bojer | — <i>C. lanceolata</i> (Poir.) A. Chev. subsp. <i>lanceolata</i> |
| <i>G. indica</i> J. F. Gmel. | — <i>Hiptage madablota</i> Gaertn. (Malpighiaceae) |
| <i>G. inflexa</i> Baill. | |
| <i>G. intermedia</i> Ridl. | — <i>G. diversifolia</i> |
| <i>G. junghuhniana</i> Miq. | |
| <i>G. kochummenii</i> Malcomber | |
| <i>G. koenigii</i> (Arn.) Wight, nom. illeg. | — <i>G. vaginans</i> |
| <i>G. koenigii</i> var. <i>divaricata</i> (Thwaites) C. B. Clarke | — <i>G. divaricata</i> |
| <i>G. koenigii</i> var. <i>oxyphylla</i> (Benth.) C. B. Clarke, nom. illeg. | — <i>G. junghuhniana</i> |
| <i>G. koenigii</i> var. <i>thyrsiflora</i> (Arn.) Thwaites, nom. illeg. | — <i>G. vaginans</i> |
| <i>G. lacerata</i> ined. | — <i>G. furcellata</i> |
| <i>G. lanceolata</i> Bouton ex A. DC. | — <i>G. pendula</i> |
| <i>G. lanceolata</i> Ridl., hom. illeg. | — <i>G. diversifolia</i> |
| <i>G. lasianthoides</i> C. E. C. Fisch. | — <i>Psychotria rhinocerotis</i> Blume |
| <i>G. latifolia</i> Ridl. | — <i>G. diversifolia</i> |
| <i>G. laxiflora</i> Cordem. | — <i>G. vaginata</i> |
| <i>G. letouzeyi</i> Malcomber | |
| <i>G. leucothyrsa</i> (K. Krause) E. M. A. Petit | |
| <i>G. liberiensis</i> E. M. A. Petit | |
| <i>G. longevaginalis</i> , orth. var. | — <i>G. longivaginalis</i> |
| <i>G. longiflora</i> C. F. Gaertn. | identity unclear |
| <i>G. longifolia</i> Bojer | |
| <i>G. longifolia</i> var. <i>pubescens</i> Verdc. | — <i>G. longifolia</i> |
| <i>G. longipetiolata</i> R. D. Good | — <i>Psychotria gossweileri</i> E. M. A. Petit |
| <i>G. longivaginalis</i> (Schweinf. ex Hiern) E. M. A. Petit | |
| <i>G. longivaginalis</i> var. <i>bracteata</i> (E. M. A. Petit) Malcomber | |
| <i>G. longivaginalis</i> (Schweinf. ex Hiern) E. M. A. Petit var. <i>longivaginalis</i> | |
| <i>G. longivaginalis</i> var. <i>louisii</i> E. M. A. Petit | — <i>G. longivaginalis</i> var. <i>longivaginalis</i> |
| <i>G. lowryi</i> Malcomber | |
| <i>G. lushaiensis</i> C. E. C. Fisch. | — <i>C. lushaiensis</i> (C. E. C. Fisch.) C. E. C. Fisch. |

Appendix 2. Continued.

| Name | Taxonomic identity |
|--|---|
| <i>G. macrobotrys</i> Baker | |
| <i>G. macrostipula</i> Baker | |
| <i>G. madagascariensis</i> (Hook. f.) Malcomber & A. P. Davis | |
| <i>G. microphylla</i> Capuron ex Malcomber & A. P. Davis | |
| <i>G. monstruosa</i> Malcomber | |
| <i>G. morindoides</i> Baker | – <i>Morinda morindoides</i> (Baker) Milne-Redh. |
| <i>G. obesa</i> Hook. f. ex C. B. Clarke | |
| <i>G. oblanceolata</i> King & Gamble | |
| <i>G. oblanceolata</i> Ridl., hom. illeg. | – <i>G. diversifolia</i> |
| <i>G. oblanceolata</i> var. <i>diversifolia</i> (Ridl.) Beusekom | – <i>G. diversifolia</i> |
| <i>G. obovata</i> Baker | |
| <i>G. obovata</i> Baker var. <i>obovata</i> | |
| <i>G. obovata</i> var. <i>sphaerocarpa</i> (Baker) Malcomber | |
| <i>G. obtusifolia</i> (DC.) Roxb. | – <i>H. obtusifolia</i> (Roxb.) DC. (Malpighiaceae) |
| <i>G. occidentalis</i> Baill. | – <i>G. paniculata</i> |
| <i>G. ovata</i> Ridl. | – <i>G. diversifolia</i> |
| <i>G. oxycarpa</i> Drake | identity unclear |
| <i>G. oxyphylla</i> Benth. | – <i>G. junghuhniana</i> |
| <i>G. oxyphylla</i> Drake, hom. illeg. | – <i>G. pendula</i> |
| <i>G. oxyphylla</i> var. <i>angustifolia</i> Ridl. | – <i>G. junghuhniana</i> |
| <i>G. pangati</i> Rheede ex Retz. | – <i>Sphenoclea zeylanica</i> Gaertn. (Lobeliaceae/Campanulaceae) |
| <i>G. paniculata</i> Benth. | |
| <i>G. parviflora</i> Bojer | – <i>G. psychotrioides</i> |
| <i>G. parvipaniculata</i> E. M. A. Petit | – <i>G. leucothyrsa</i> |
| <i>G. pauciflora</i> Malcomber & A. P. Davis | |
| <i>G. pedicellata</i> Ridl. | – <i>G. ramosa</i> |
| <i>G. pendula</i> Bojer | |
| <i>G. petrinensis</i> Verdc. | – <i>G. edentata</i> |
| <i>G. phanerophlebia</i> Baker | |
| <i>G. phyllosepala</i> Baker | |
| <i>G. phyllostachya</i> Baker | |
| <i>G. plagiocalyx</i> K. Schum. | – <i>G. longivaginalis</i> var. <i>longivaginalis</i> |
| <i>G. pongatii</i> , orth. var. | – <i>Sphenoclea zeylanica</i> Gaertn. (Lobeliaceae/Campanulaceae) |
| <i>G. psychotrioides</i> (DC.) Baker | |
| <i>G. quadriseta</i> A. DC. | – <i>G. psychotrioides</i> |
| <i>G. quadriseta</i> var. <i>brevipes</i> A. DC. | – <i>G. psychotrioides</i> |
| <i>G. quadriseta</i> var. <i>hebepoda</i> A. DC. | – <i>G. psychotrioides</i> |
| <i>G. quadriseta</i> var. <i>petiolaris</i> A. DC. | – <i>G. psychotrioides</i> |
| <i>G. quadriseta</i> var. <i>platypoda</i> A. DC. | – <i>G. psychotrioides</i> |
| <i>G. racemosa</i> (Cav.) Roxb. | – <i>H. benghalensis</i> (L.) Kurz (Malpighiaceae) |
| <i>G. ramosa</i> Ridl. | |
| <i>G. raphaelii</i> Malcomber | |
| <i>G. rhodantha</i> Baker | – <i>G. spicata</i> |
| <i>G. richardii</i> Drake | – <i>Psychotria</i> sp. |
| <i>G. rigida</i> Ridl. | – <i>G. diversifolia</i> |
| <i>G. rosea</i> Thwaites ex Benth. | |
| <i>G. rotundifolia</i> Bojer | |
| <i>G. rufinervis</i> Stapf | – <i>Psychotria</i> L. sp. |
| <i>G. salicifolia</i> C. H. Wright ex Baker | – <i>G. trachystyla</i> |
| <i>G. salicifolia</i> Hutch. & Gillett, hom. illeg. | – <i>G. liberiensis</i> |
| <i>G. schatzii</i> Malcomber | |
| <i>G. schizocalyx</i> Bremek. | |
| <i>G. sessiliflora</i> Ridl. | – <i>G. ramosa</i> |
| <i>G. sieberi</i> C. Presl | – <i>G. calycina</i> |
| <i>Gaertnera</i> sp. A Verdc. | probably – <i>G. calycina</i> |
| <i>G. spathacea</i> Boivin ex Drake | – <i>G. arenaria</i> |

| Appendix 2. Continued. | |
|--|--|
| Name | Taxonomic identity |
| <i>G. sphaerocarpa</i> Baker | — <i>G. obovata</i> var. <i>sphaerocarpa</i> |
| <i>G. spicata</i> K. Schum. | |
| <i>G. sralensis</i> (Pierre ex Pit.) Kerr | |
| <i>G. stictophylla</i> (Hiern) E. M. A. Petit | identity unclear |
| <i>G. taiensis</i> Kerr | — <i>G. junghuhniana</i> |
| <i>G. ternifolia</i> Thwaites | |
| <i>G. thyrsiflora</i> (Arn.) Blume | — <i>G. vaginans</i> |
| <i>G. trachystyla</i> (Hiern) E. M. A. Petit | |
| <i>G. thouarsii</i> Baill. | identity unclear |
| <i>G. truncata</i> A. DC. | — <i>G. psychotrioides</i> |
| <i>G. vaginans</i> (DC.) Merr. | |
| <i>G. vaginans</i> subsp. <i>junghuhniana</i> (Miq.) Beusekom | — <i>G. junghuhniana</i> |
| <i>G. vaginans</i> subsp. <i>junghuhniana</i> f. <i>hermaphroditica</i> Beusekom | — <i>G. aphanodioica</i> |
| <i>G. vaginata</i> Lam. | |
| <i>G. viminea</i> Hook. f. ex C. B. Clarke | |
| <i>G. violascens</i> Ridl. | — <i>Psychotria</i> sp. |
| <i>G. walkeri</i> (Arn.) Blume | |
| <i>G. walkeri</i> var. <i>angustifolia</i> Benth. | — <i>G. ternifolia</i> |
| <i>G. walkeri</i> var. <i>gardneri</i> (Thwaites) C. B. Clarke | — <i>G. ×gardneri</i> |
| <i>G. zimmermannii</i> K. Krause & Gilg | — <i>Strychnos</i> L. sp. (Loganiaceae) |
| <i>G. zollingeriana</i> Miq. | — <i>G. junghuhniana</i> |
| <i>Grumilea fissistipula</i> K. Schum. & K. Krause | — <i>G. bieleri</i> |
| <i>Hymenocnemis madagascariensis</i> Hook. f. | — <i>G. madagascariensis</i> |
| <i>Mussaenda borbonica</i> Lapeyrère | — <i>G. vaginata</i> |
| <i>Ophioxylon arboreum</i> Koenig ex DC., nom. nud., pro syn. | — <i>G. vaginans</i> |
| <i>Pristidia divaricata</i> Thwaites | — <i>G. divaricata</i> |
| <i>Psychotria bieleri</i> De Wild. | — <i>G. bieleri</i> |
| <i>P. furcellata</i> Baill. ex Vatke | — <i>G. furcellata</i> |
| <i>P. guillotii</i> Hochr. | — <i>G. inflexa</i> |
| <i>P. leucothyrsa</i> K. Krause | — <i>G. leucothyrsa</i> |
| <i>P. longivaginalis</i> Schweinf. ex Hiern | — <i>G. longivaginalis</i> |
| <i>P. obesa</i> Wall., nom. nud. | — <i>G. obesa</i> |
| <i>P. oxyphylla</i> Wall., nom. nud. | — <i>G. junghuhniana</i> |
| <i>P. sralensis</i> Pierre ex Pit. | — <i>G. sralensis</i> |
| <i>P. stictophylla</i> Hiern | — <i>G. stictophylla</i> |
| <i>P. trachystyla</i> Hiern | — <i>G. trachystyla</i> |
| <i>P. vaginans</i> DC. | — <i>G. vaginans</i> |
| <i>P. viminea</i> Wall., nom. nud. | — <i>G. viminea</i> |
| <i>Sykesia acuminata</i> (Benth.) Kuntze | — <i>G. junghuhniana</i> |
| <i>S. arenaria</i> (Baker) Kuntze | — <i>G. arenaria</i> |
| <i>S. calycina</i> (Bojer) Kuntze | — <i>G. calycina</i> |
| <i>S. crassiflora</i> (Bojer) Kuntze | — <i>G. crassiflora</i> |
| <i>S. cuneifolia</i> (Bojer) Kuntze | — <i>G. cuneifolia</i> |
| <i>S. edentata</i> (Bojer) Kuntze | — <i>G. edentata</i> |
| <i>S. grisea</i> (C. B. Clarke) Kuntze | — <i>G. grisea</i> |
| <i>S. hongkongensis</i> (Seem.) Kuntze | — <i>I. chinensis</i> Lam. |
| <i>S. junghuhniana</i> (Miq.) Kuntze | — <i>G. junghuhniana</i> |
| <i>S. koenigii</i> Arn., nom. superfl. illeg. | — <i>G. vaginans</i> |
| <i>S. lanceolata</i> Kuntze, nom. nud. | identity unclear |
| <i>S. longifolia</i> (Bojer) Kuntze | — <i>G. longifolia</i> |
| <i>S. macrobotrys</i> (Baker) Kuntze | — <i>G. macrobotrys</i> |
| <i>S. macrostipula</i> (Baker) Kuntze | — <i>G. macrostipula</i> |
| <i>S. obovata</i> (Baker) Kuntze | — <i>G. obovata</i> var. <i>obovata</i> |
| <i>S. oxyphylla</i> (Benth.) Kuntze | — <i>G. junghuhniana</i> |
| <i>S. paniculata</i> (Benth.) Kuntze | — <i>G. paniculata</i> |

Appendix 2. Continued.

| Name | Taxonomic identity |
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| <i>S. pendula</i> (Bojer) Kuntze | – <i>G. pendula</i> |
| <i>S. phanerophlebia</i> (Baker) Kuntze | – <i>G. phanerophlebia</i> |
| <i>S. phyllosepala</i> (Baker) Kuntze | – <i>G. phyllosepala</i> |
| <i>S. phyllostachya</i> (Baker) Kuntze | – <i>G. phyllostachya</i> |
| <i>S. psychotrioides</i> (DC.) Kuntze | – <i>G. psychotrioides</i> |
| <i>S. rosea</i> (Thwaites ex Benth.) Kuntze | – <i>G. rosea</i> |
| <i>S. rotundifolia</i> (Bojer) Kuntze | – <i>G. rotundifolia</i> |
| <i>S. sphaerocarpa</i> (Baker) Kuntze | – <i>G. obovata</i> var. <i>sphaerocarpa</i> |
| <i>S. ternifolia</i> (Thwaites) Kuntze | – <i>G. ternifolia</i> |
| <i>S. thyrsiflora</i> Arn. | – <i>G. vaginans</i> |
| <i>S. vaginans</i> (DC.) Kuntze | – <i>G. vaginans</i> |
| <i>S. vaginata</i> (Lam.) Kuntze | – <i>G. vaginata</i> |
| <i>S. viminea</i> (Hook. f. ex C. B. Clarke) Kuntze | – <i>G. viminea</i> |
| <i>S. walkeri</i> Arn. | – <i>G. walkeri</i> |
| <i>S. zollingeriana</i> (Miq.) Kuntze | – <i>G. junghuhniana</i> |
| <i>Tsiangia hongkongensis</i> (Seem.) P. P. H. But,
H. H. Hsue & P. T. Li | – <i>I. chinensis</i> Lam. |
| <i>Uragoga sralensis</i> Pierre ex Pit. | – <i>G. sralensis</i> |
| <i>U. stipulacea</i> Kuntze | – <i>G. obesa</i> |